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THE ECONOMICS OF RAILWAY TRANSPORT

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THE ECONOMICS

OF

RAILWAY TRANSPORT

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"There be three things which make a nation great and prosperous—a fertile soil, busy workshops, and easy conveyance for men and commodities from one place to another."—BACON.

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PREFACE

During the early months of the present year the author gave a short course of lectures at Cambridge on "The Economics of Transport," and this volume has originated in an attempt to reproduce the substance of those lectures in some connected form. In carrying the project into execution so much has necessarily been added, subtracted, and modified that little real similarity now remains, but mention is made of this fact since it indicates not only the origin of this book but also to some extent its scope and purpose. For what has been aimed at is neither an addition to the theory of economics nor to the existing literature on railway working purely as a business pursuit, but a modest attempt to show the interconnection of the two, the degree to which economic principles are found to be actively

operative in this great industry, however thwarted by non-economic factors and obscured by mitigating circumstances.

It is hoped that the result may be of some interest and profit to two classes of readers—to economic students as exemplifying the degree to which practice must necessarily differ from theory, the concrete from the abstract; and to railway men, as showing the operation of scientific principles in their work.

Of the presence of numerous faults of omission and commission no one can be more conscious than the writer. In regard to these he would plead the exigencies of time, for this book has had to be completed within the limits of a single furlough. As to other faults which may, and no doubt will, be obvious to the experienced reader, he can say nothing save to express the hope that his work may possibly induce others of wider experience and greater leisure to enter a field which up to the present has perhaps hardly received from British writers the attention due to it.

Acknowledgments are due—and are here

gladly given—to numerous authors, not only for specific passages quoted from them, but also for the benefit of their views generally as expressed in their works. In regard to economic theory the writer has endeavoured to follow the views of Emeritus Professor Alfred Marshall, to whom in common with all who have studied Economics at Cambridge during recent years he is largely indebted not only for instruction but also for interest in, and liking for, the subject. On the more practical side of railway working, mention may be made of Dr. Lardner, M. Colson, and especially of the valuable work of the late A. M. Wellington. On railway rates and railway economics generally, the works of Hadley, William Z. Ripley, and Taussig among American writers, and of Pratt, Acworth, M'Dermott, and Marriott among British authors have been freely used.

Lastly, sincere thanks are due to his friend and colleague, Mr. F. Froom, Superintendent of Transportation, East Indian Railway, for help in connection with certain parts, and

to the writer's wife, who has aided him in the correction of the proofs, and whose sympathy and encouragement have in no small degree assisted towards the completion of the work.

LONDON, *October* 1909.

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INTRODUCTION

Transport in general may be defined as the conveyance of persons or goods from one locality to another. In order that it may come within the purview of the economist it is necessary that it be undertaken for some material consideration. In itself, therefore, transport is primarily a function of distance, and when considered by the economist it is the overcoming of distance for a profit.

In addition to this primary element of distance there are, however, two others—speed and risk—which are characteristic of economic transport. Though both of these will be found to exist to some extent in every transaction coming within our scope, their respective importance varies widely, and, roughly speaking, they are mutually exclusive. For in the old days the capital and skill

invested in ship or caravan was small as we reckon things to-day, and the merchant adventurers of that time could afford to be comparatively indifferent to the length of the journey, provided only a fair proportion of their goods escaped the dangers of storm and robbery and duly reached their market, compensating themselves for the slowness and smallness of their "turn-over" by the high percentage of their profits. But now that the inventions of the last century have revolutionized transport by land and sea, the element of risk has, it is true, been minimized. On the other hand, the capital invested has reached such dimensions that the great systems of railways and steamboats must be worked to their utmost. Many trips must now be made where one was deemed sufficient a hundred years ago, and the element of speed is a primary consideration.

As we shall naturally be principally concerned with the present-day conditions of transport, it is therefore the elements of space and time that will chiefly call for consideration and more particularly their antagonistic relation with one another. It will also be

necessary to discuss to some extent the mechanical conditions determining the transport of material bodies both by land and water. For though the detailed examination of these is a technical matter to be dealt with by engineers, the broad facts are well known and must be present in the mind of any who are called upon to decide questions of economic policy in the industry of transport.

Lastly, it seems desirable that the importance of the element of profit should be emphasized. For, as we shall see later, all systems of transport are for certain reasons, political, legal, economic, peculiarly subject to the influence of the State, in their construction, maintenance, and working. And while it will be necessary to recognize the influence of political and humanitarian considerations, which have considerable economic importance, they cannot be accurately analysed and weighed by the economist; once recognized, they must be eliminated in further discussion, and attention concentrated on motives capable of being expressed in terms of money or its equivalents.

Transport has as its natural basis the prin-

ciple of division of labour as affected by the heterogeneous character of the earth's surface. The latter is for us a given fact, and its origin is beyond our scope. In the words of Edward Whymper (*Scrambles in the Alps*, chapter vi. sec. 1): "If ever the surface of the earth was as true as if it had been turned out from a lathe, it was certainly not so when the great glaciers—whose poor remnants we now see in the Alps—began to stretch far away from the mountains on to the lowlands of Switzerland and on to the plains of Piedmont." Within historic times, at least, this planet has shown wide variations in its surface, configuration, temperature, rainfall and winds, not substantially different from those with which we ourselves are familiar. The fruits of mining, the produce of the soil, the indigenous fauna and flora of each country, vary in character, variety, abundance and accessibility.

The principle of economic organization which we call the "division of labour" is, however, one which it is possible to consider in its historical development. Primitive mankind, having—by virtue of that superior intelligence which differentiated him from

the rest of the animal world—obtained the advantage or "leverage" in the struggle for existence which enabled him to acquire special skill and to accumulate this skill and labour in the fashioning of tools, implements and weapons, was then able to initiate the apportioning of the various functions of the family or tribe according to liking and aptitude. Specialization in occupation necessarily led to barter or trade—the special produce of each member of the community in excess of his own requirements being exchanged by him for the articles produced by others and needed by him. Thus, we may suppose, was established trade within the community, though so far there is no demand for transport. For the members of any one community in such an epoch would necessarily live within a small compass, and since the raw materials of industry derived from nature would not vary widely within one district the process of differentiation and specialization would be limited chiefly to the results of variations in human skill and energy. The time would come, however, when the possession of beasts of burden, and the impulse of curiosity or the

ardour of the chase, coupled with adventurous spirits, would lead to excursions further afield, and to acquaintance with nature and with mankind in different forms. Thus would arise a knowledge of new commodities, and with this knowledge a corresponding demand. Doubtless, efforts would be made to meet these demands by the establishment of the new industry within the original community. But cases would arise when this could not be done at all or only at a higher cost than involved by transport of the commodity. Ways and means of transport would be found, and with them we have all the conditions essential to economic transport, viz. a commodity produced at one place at a cost which, when increased by the cost of transport, is still less than the demand price for that commodity at another place.

HISTORICAL SURVEY

We have just seen that even in hypothetical primitive communities transport is closely bound up with commerce or trade in general, since so soon as the latter passes beyond the limits of the tribal family its development is interdependent with that of transport. So far as economic theory is concerned, both might have developed slowly but surely, *pari passu*, until the present day. But, in fact, the history of both has been enormously affected by another set of considerations already alluded to above, the necessity of overcoming the mechanical and other difficulties encountered in the movement of material commodities.

The mechanical conditions imposed by nature appear at first to have been inequitably arranged. For transport by water is not only very much easier than by land by reason of

the lower frictional resistance,[1] but it is on water that nature also provides motive power in the shape of wind, tides, and currents. Naturally, therefore, the dwellers on the sea coast and by the banks of great rivers were the first to show signs of advance. The lessons learnt in fishing from the shore would soon point to the advisability of being able to remain longer on the surface of the water than was possible by swimming. The primitive boat was ready almost to hand in the palm tree, which, hollowed out, still forms the commonest type of boat in some countries, or in colder climes in the rafts made of branches of trees rendered buoyant by inflated skins, a type of craft still in use in the valleys at the foot of the Himalayas. Primitive paddles and sails followed soon, and development in the line of vessels and oars of superior strength and durability was comparatively easy. But

[1] It is not easy to give authoritative figures of the comparative resistances to be overcome by road, rail, river and sea, as these are affected by speed, the shape or style of animals, vessels and vehicles, and other considerations. It has been stated that at the low speed of 3 feet per second

1 horse-power will draw		3,000	lbs.	on a good road,
,,	,,	30,000	,,	on a level railway,
,,	,,	200,000	,,	through water.

(See also Colson, *Transports and Tariffs*, chap. vi. p. 1.)

at this step nature showed a tendency towards compensating action. For though the dwellers by the sea had the material necessities for quite considerable voyages within calm waters, they were slavishly dependent on favourable winds except in the case of vessels propelled by oars, and the very uniformity of water, which made its mechanical resistance so easy to overcome, had the great disadvantage of giving no landmarks, nothing whereby position and direction could be determined when out of sight of land. True, this defect did not exist in the case of navigable rivers, but with them, on the other hand, there was no possibility of voluntary direction at all, the natural course of the stream being the only possible way. And while the current of a river was useful enough in one direction, it made movement in the other extremely difficult. The tidal river avoided this defect, and it is significant that many of the large towns of antiquity were near the head of tidal action.

Turning to the other side of the picture, we find that early progress on land was determined chiefly by the species of animals capable of being turned into beasts of burden.

Nomadic tribes, whose prosperity depended chiefly on their herds of horses, asses, and oxen, early learnt the usefulness of these as pack-animals and for the carriage of persons. The next step was the invention first of a sledge of wood or basket-work, and then of wheeled vehicles. Both chariots and wagons were known to the Egyptians, in whose country nature, though not providing made roads, had at least provided level stretches of country with sandy surface. Indeed, the Egyptians actually advanced to the use of leather tyres before 1400 B.C. But wheeled carriages were for many centuries used only sporadically and by the wealthier classes. For mankind found no prepared highway of commerce on land, but had to combat all the difficulties of mountain, forest, and swamp, and roads even when made were for long generations maintained so badly that transport by them was uneconomical and costly. True, the Romans had set an example of boldly-conceived and well-executed roads at a very early date,[1] but these were often carried out for military and strategic reasons. They

[1] The Appian Way, 331 B.C.

were therefore not infrequently carried (especially in conquered countries) along the crest of a ridge, to facilitate a knowledge of the enemy's whereabouts and to prevent ambush. Thus their military excellence involved their economic imperfection. And with the decline and fall of the Roman Empire there came to pass a general deterioration and abandonment of this system of roads. Nor did any natural successor arise except and until the growth in wealth and power of the "Hanseatic League," which, for purely trade purposes, designed and carried out an elaborate system of roads in Northern Europe. It is not, therefore, surprising to find that as late as the sixteenth century covered carriages were used only by ladies of rank, their use by men being also retarded by the idea of their effeminacy. Even at a much later date, though the construction of English turnpikes commenced with the opening of the eighteenth century, transport by road, both of persons and goods, had reached but a poor state of development in well-populated parts of England. Thus in the *British Almanac* for 1837 it is stated:

A gentleman now living at Horsham in Sussex has stated, on the authority of a person whose father carried on the business of a butcher in that town, that in his time the only means of reaching London was either by going on foot or on horse-back—the latter method not being practicable at all periods of the year nor in every state of the weather, and that the roads were never at that time in such a condition as to admit of sheep or cattle being driven upon them to the London markets, for which reason the farmers were prevented sending thither the produce of their lands, the immediate neighbourhood being in fact their only market. Under these circumstances the quarter of a fat ox was commonly sold for about 15s., and the price of mutton was 1¼d. per lb.

And the caustic comments of Mr. Thomas Young in his *Tour in the North of England* (published 1770) on the "ruts 4 ft. deep in autumn, in the 18 miles of infernal road of execrable memory" are well known. Things were, however, better in France, where the genius of Colbert had initiated the first great national system of roads, soon afterwards to be carried to a high pitch of perfection under the Napoleonic régime.

In the meantime much had been done by adventurous and inventive spirits in over-

coming the difficulties of direction at sea. The Phoenicians, the first nation to attain maritime fame, had discovered the usefulness of the North Star, which at one time was therefore known as the "Phoenician" star, but the discovery, or at least the economic discovery, of the magnetic needle in Europe was not until the beginning of the fourteenth century.[1] The astrolabe followed about a century later, Vernier's quadrant by 1631, and Hadley's by 1731. By the end of the eighteenth century other useful discoveries had been made, the division of meridional lines, the construction of Mercator's projection, the measuring of a nautical mile, and the compensating chronometer. In fact the only really important improvement of modern times in navigation, as distinct from propulsion, has been the perfected compass of Sir William Thomson (Lord Kelvin), invented in 1870.

Thus at the opening of the manufacturing era, in which the principle of division of and

[1] It is on record that in 2634 B.C. a certain Chinese general defeated another through the possession of a chariot on which was a figure always indicating the south. In this connection it is interesting to remember that a Chinese crew is said to have reached India between 419 and 265 B.C. The Arabs are also said to have known of the compass long before the date given in the text.

specialization in industry has been realized, transport by water was decidedly ahead of that by land. The well-built and well-navigated clipper ships of that time were looked upon with pardonable pride, and the over-sea commerce of England, first fostered by England's greatest piece of "Protection"—the Navigation Act of 1651—but soon to become intrinsically powerful, was a factor of importance in the national prosperity.

It is true that in regard to canals English engineers had been by no means backward. The first English canal was commenced in 1760, and the early achievements of British canal engineers are difficult to excel. The Barton aqueduct, which carried the Bridgewater Canal for 600 feet across the Irwell, was opened in 1761 and remained in use until 1893. The Lancaster aqueduct, also 600 feet long, was completed in 1796; the Chirk, 710 feet, in 1807; and the Pontcysyllte, 1007 feet, in 1803. But the great difficulty of these works is reflected in their high cost; and the difficulties and expense, both in construction and working, due to the frequent locks found necessary in such a hilly country as England,

—and one, moreover, where the hilly parts were also the busiest,—were even more serious. Indeed, England is essentially a country of which it may be stated, using the words of Bartholomew (*Atlas of the World's Commerce*), that it has been more generously treated by nature through its ample facilities for the construction of railways than by being well provided with navigable rivers. Moreover, canals had found no motive power more efficient than horse traction.

But further inventions were soon to follow, both on sea and land, which, synchronizing with the rapid development of manufacturing industries, were to effect a gigantic revolution in the life of nations. The inefficiency of land transport by draught wagon was well recognized, and with the opening up of the coal-mining industry in Northumberland became too marked to be tolerable. Attention was first paid, however,—and it would seem rightly,—to the improvement of the way rather than of the motive power or vehicle. In 1676 a prepared wooden way was made (vide *Life of the Lord Keeper North*) by which "one horse will draw down 4 or 5 chaldron of coals and

is an immense benefit to the coal merchants." By 1765 this prepared wooden way had been improved on the lines of the modern steel railway, but still utilizing wood, and "the load of a one-horse cart which on the common road was 17 cwt. was increased to 42 cwt." (*British Almanac*, 1837). Two years later cast-iron rails were being experimented with, and in 1800 stone props were substituted for wooden sleepers. In 1801 the first actual working iron railroad from Wandsworth to Croydon was opened. In 1824 wrought-iron was substituted for cast-iron and the greater cost was found justified by increased durability.

Meanwhile the steam-engine had been progressing, though naturally, in view of its much higher complexity, at a slower rate. Following on the respective work of Savery and Watt on stationary atmospheric and condensing steam-engines, Trevethick in 1804 actually brought into use a locomotive engine, and by 1830, in the words of Dr. Lardner (*The Steam Engine*, London, 1836), there was "a ponderous engine of iron loaded with several hundred passengers in a train of carriages of corresponding magnitude, and

a large quantity of water and coal, taking flight from Manchester and arriving at Liverpool—a distance of above thirty miles—in little more than an hour."

Dr. Lardner speaks of the performance as "not less wonderful for the weight transported than for the rapidity of transit thus attained," but with commendable prescience foretells that the art of constructing locomotive engines, so far from having then attained a state of maturity, was only in its infancy. And in fact, though high speeds were attained at a comparatively early date, in all other respects, and also in average speed and punctuality, there has been steady uninterrupted progress up to the present time. Heavy passenger trains of 300 tons containing every imaginable comfort, not to say luxury, are now hauled for long distances at high speeds with safety and punctuality and at very low fares. In quantity, too, passenger traffic has grown enormously, and has attained national importance through the freer movement of labour and the beneficial effect on dwellers and workers in large centres. Goods trains, of weights up to 2500 tons gross load,

are now hauled at speeds exceeding that to which Dr. Lardner refers, and at lower rates than he would have thought possible. But it is in the greater economy brought about that most has been effected, for, as Hadley long ago pointed out, while the pioneers of railways over-estimated the speed they under-estimated the economies to be attained.

At the same time, no single improvement is outstanding in its importance. The use of electricity has, it is true, revolutionized urban and suburban traffic, for which its great advantages of more rapid acceleration and superior cleanliness render it peculiarly suitable. But the necessary plant is expensive to erect and maintain, is peculiarly uneconomical for work varying widely in its amount from hour to hour, and cannot be well adapted to the "casual" work of a railway, the shunting and sorting of carriages and wagons in station-yards and terminals. Moreover, its use is not devoid of risk to the uninformed employee. As the means of subsidiary advantages, in train-lighting and ventilating, it has, however, great virtues which are being rapidly utilized.

The application of the great invention of

steam power to shipping followed soon on its use in land-transport. There were, however, some inherent difficulties peculiar to the sea. There was the difficulty of obtaining a constant supply of fresh water and of coal. Moreover, the first method of applying the power by means of paddles (suggested by the water-wheel) had serious disadvantages, especially for large vessels and in bad seas. Thus for some time steam vessels found difficulty in competing effectively on long voyages with sailing ships, rejuvenated as these were by the use of iron and steel, and with their cheaper construction and maintenance, coupled with their higher ratio of cargo-space. Indeed, in extreme cases, that is to say, for very long voyages with cargoes of low value, the competition exists to this day. But the invention of the screw, the use of water-ballast, the substitution of steel for iron, and the improvement of marine boilers, coupled with the establishment of numerous coaling stations at convenient points and the discovery and opening up of coal measures in many countries, have by now revolutionized sea-transport also. During the last half-

century particularly the strides made have been enormous.

Within recent times the invention of turbines has shown a means of overcoming the difficulties, which with reciprocating engines rendered further progress difficult. For while with the latter increased speed for larger vessels (for which it is chiefly desired, the demand for increased speed and comfort naturally coming from the same class) could only be obtained by an extravagant expenditure in engine power—in its prime cost, the fuel consumed and the space occupied—the turbine has shown that it is possible to obtain the highest speeds with less fuel and with smaller space occupied. But even the turbine is limited by an inherent difficulty which must attend all maritime transport, that of obtaining from such an unstable element as water the requisite purchase or leverage obtained so easily on *terra firma*. Thus, as speeds and power are increased, the ratio of efficiency becomes less and less. On the whole it seems probable that the limits of economy in the speed and size of vessels have been reached—indeed,

already passed. Further development for the present is more likely to be in the direction of attaining present standards at lower cost. This probability is accentuated by the heavy cost of improving harbours and estuaries to enable them to take the largest craft.

Electricity has many uses at sea, but these are—as we saw was largely the case with land-transport—rather in the direction of added conveniencc than economy. It is possible that its further use may lead to economy through a diminution of the wages bill, but at present it has been most developed in men-of-war and liners of the largest class, where economical considerations are not paramount. Electricity clearly has no place as a prime mover for ocean-going ships, but is being used for canals, for which, indeed, the simpler nature of the traffic makes it more suitable than railways. But its great advantage of rapid acceleration has not sufficient scope on canals, where under present conditions speed is not of first importance, and indeed can hardly be cultivated owing to the serious erosion of the banks which would arise.

Lastly, it is necessary to mention the

possibilities of oil-gas plant for the less pretentious kind of ocean steamers and for inland vessels. This source of power is cheap, occupies little room, and has the advantage of making no demand on the world's supply of coal, though it does on the comparatively larger supplies of mineral oil. It may have great future importance.

ECONOMIC ANALYSIS

THE general connection of transport with the division of labour and the localization of industries has already been indicated; and also the rough synchronization of development in the two directions. We may now consider in greater detail the relations of transport to the great processes of production, distribution, and consumption.

RELATION TO PRODUCTION AS A WHOLE.

The variety of nature, which we saw must have formed the *fons et origo* of the division of labour, must also be reckoned as the principal permanent cause of this organization. For if we adopt the classification of Bartholomew,[1] and divide all material products into the following four classes: (1)

[1] *Atlas of the World's Commerce*, to which the writer is also indebted for many of the facts mentioned in the text of this chapter.

those derived from wild animals, trees, etc., (2) those derived from agriculture and live-stock, (3) minerals, (4) manufactured articles—it is obvious that geographical considerations are of some importance in all four classes, of great importance in the first three, and of paramount importance in the first class.

With mineral industries nature herself definitely limits the number of districts in which they can exist at all. Nature again further limits the number of places in which minerals can profitably be won from nature. Thus it is said that the development of the Coolgardie gold-fields long after the existence of gold in paying quantities was established was seriously hindered by the lack of rain, and that in the Yukon field the output depends upon the rainfall as completely as do the agricultural crops in other parts of Canada. But this dependence on nature does not mean that mineral industries are independent of all changes of locale. On the other hand, their very nature involves such changes, for they, and they alone, have absolute limits towards which mankind is steadily working, and as the deposits in one place are exhausted, mankind

must strive to find their like elsewhere. Thus in the case of natural deposits, such as salt, borax, nitrate of soda, the ores of various metals, coal and mineral oil, every unit extracted from one field hastens on the day when the industry must move. But such moves must be to other localities of the same kind, and the change is one of locality, not in the degree of localization. In the case of animal and agricultural products, nature's limits are less exactly set. There are cases in which the first site of an agricultural industry has been settled, so to speak, arbitrarily. Thus the tea plant is believed to have been first cultivated in China, but it is now cultivated to better purpose in India and Ceylon. Coffee, too, is a comparatively recent immigrant into Brazil, but the world's markets are now dominated from San Paulo. Or take the case of wheat. At one time, for a variety of reasons, the "middle-west" states of the United States were the centre of the world's granary. Then as these grew in population and accumulated wealth and turned their attention to manufactures, the wheat farmer moved farther west. Now it would seem that the centre of the

industry is already moving across the border into Canada. In fact, most of the main staples of food can be cultivated in many districts possessing certain essential attributes. And there is no great difficulty in localizing them in a number of places. But as new districts come into cultivation, the old ones drop out of the industry and embark in others for which the changing economic conditions make them more suitable. It is therefore in their case also a change of locality rather than in the fact or degree of localization. And with some agricultural crops the human factor counts for much. Thus, although the American cotton-grower in the Southern States grows the plant—which is a perennial when the temperature admits of it—in a climate where the frost kills it every year, he still grows the finest cotton in the world, and his product forms the most important and valuable article of export from the whole of that country.

In the case of manufactured articles, the limits of localization are least of all defined by nature. In the olden days, when steam was the sole motive power, the presence of coal

near by was an important determining factor in locality, but now it is possible by the use of electricity to harness the forces of nature, waterfalls, rivers, streams, and lakes. Still the independence of coal is only gained by an even closer dependence on natural water-power. In many industries again, some heavy and bulky raw material, such as iron ore, is needed, and must be obtained cheaply. But in others, the raw material is comparatively valuable, and freight on it is not a weighty factor in its cost at the place of manufacture. Or it has already come so far that some distance farther makes little difference. Thus it has been found possible to develop many manufactures in numerous places and countries possessing certain essential industrial assets but no special natural advantages. On the other hand, it is in the case of these commodities, where nature's limits are less defined, that the human factor has done most to conserve these productions to certain localities. For it is to them that the "Law of Increasing Returns" most strongly applies. The early acquired—almost inherited—knowledge, aptitude, and dexterity of the worker, the

prestige of a well-known name, the growth of connected industries and of the necessary facilities of transport and marketing, the economy of production on a large scale may do wonders in preserving the supremacy of a particular place in some industry. Thus the iron and steel works of the North of England, though they now import most of their iron ore from Norway and Spain, still rank as important producers of pig-iron, and their steel stands unrivalled in quality throughout the world. Similarly, the cotton-mills of Lancashire, though now they have to face the competition of well-built, well-equipped, and well-managed mills in India, Japan, and latterly in South America, possessing the advantages of locally-grown raw material and cheap labour, still compete very effectively in these markets. The localization of manufactures is still a feature of the world's productions, and international trade, therefore, an outstanding feature of modern commerce.

There is indeed an important consideration which undoubtedly tends to check international trade. This is the existence of separate nations, and the resultant *esprit de corps* or

national spirit. From the existence of these separate entities grows a spirit and a policy which in its best form becomes the desire of each that its state shall become independent of other possibly hostile states, able to rely on its own resources in regard to its food and its manufactures—an intelligible and, indeed, a praiseworthy ideal. To carry out this policy, home industries are encouraged by bounties and state subventions, while foreign competition is debarred by hostile import tariffs. Each of the leading nations of the world has at some time adopted such a policy, and in each case it has been successful from many points of view, though the price paid by the consumer has been a heavy one. But it brings in its train as an inevitable consequence the defeat of the very policy which called it into existence. For, as a nation advances from the pastoral to the agricultural and from the agricultural to the manufacturing state, while it increases in population and wealth, it becomes in reality less and less independent of others. The ability of the best of its sons and most of their wealth is transferred from the production of food to that of manufactured

articles. Less land is devoted to agriculture, more to manufacture. In the meanwhile population grows apace. Necessarily, then, while such a country has been attaining success as a manufacturing state, it has been losing ground as a producer of food. England, up to the middle of the eighteenth century, was an exporter of agricultural produce, but from that time dates the development of her trade and the growth of her colonies, together with the practical monopoly long enjoyed by English shippers, merchants, and manufacturers of textiles. This commercial development has involved, *pari passu*, a decline in agricultural importance, and she has ever since that time imported an ever-increasing proportion of her food supplies; while in 1850 two-thirds of the wheat consumed in England was grown within the country, now only about one-fourth is so grown. Similarly Germany, which only a few decades ago was an exporter of food-stuffs to England, now imports over 70 millions of bushels of wheat per annum, or nearly half as much as Great Britain, while Belgium reached this stage long before Germany, and now imports nearly as

much as Germany in spite of her much smaller population. It is more than likely that the same may happen in the United States.[1] So that the very movement towards industrial independence appears destined to defeat its own object.

It is therefore probable that in spite of all economic and politico-economic changes among the various states of the world, the general tendency towards the division of labour and the localization of products is not appreciably lessening, but that consciously or unconsciously the world moves slowly onward towards the economic ideal, the employment of each unit of capital and labour where they can give the best results when their marginal utility is highest.

It has been necessary to dwell on this at some length, because the importance of transport to production as a whole is so closely bound up with the division of labour. John Stuart Mill pointed out long ago that the

[1] During the recent "wheat corner" (April 1909) the manipulator of the markets, Mr. Patten, is reported to have said, "I am in favour of removing the tariff duty on wheat right now. . . . Take off the duty on corn, oats, and live stock too, for it will not be long before we have to import them."

degree to which the division of labour (using the term, in its most restricted sense, of manufactures only) could be carried was limited by the extent of the possible markets for commodities, and this extent was determined among other things "by the deficiency of roads and water-carriage." And the dependence of modern methods of production on transport is far wider and closer than John Stuart Mill ever dreamt of. Yet it is perhaps significant that it was an English economist who first drew attention to this function of transport. For owing to her free tariff it is England which furnishes the most conspicuous results of modern commercial development. In regard to manufactured articles, she had developed a considerable over-seas trade even before the advent of steam power. Her early discovery and utilization of her coal and iron deposits, and the advantages she derived from the boldness and endurance of some of her sons as navigators and pioneers, and from the skill and perseverance of others as inventors, gave her a valuable start in the race for industrial supremacy, which even now she retains, though in less degree and altered

form. But the volume to which her export trade has risen, the completeness and comprehensiveness of its ramifications all over the known world, the certainty, comparative promptness, and cheapness with which her goods are marketed even amongst semi-savage peoples, have exceeded expectations and have facilitated the full exploitation of the "Increasing Returns" of organized industry, almost it would seem to its economic limits. In no other case has this happened, because with all other first-class powers the artificial limits of hostile tariffs have anticipated the economic limits. It must be expected that even the less-developed countries will now endeavour to foster home industries when this can be done without the extra burden on the consumer becoming unduly severe. But even the new-born and nascent industries of such countries, though they must necessarily menace the export trade of England in its present form and tend to render nugatory the influence of further economy in transport, yet owe their very existence to the steamboats and railways which have transported to their shores the English skill, labour, and machinery,

without which they must have been postponed for many a generation.

But it is in regard to her imports, particularly those of food-stuffs, that England's dependence on modern transport is most marked. The perishable character of some of these made them seem incapable of benefiting by improved means of communication, even if this had been available at a sufficiently low cost. But this difficulty has been overcome by improvements in packing and by the use of refrigerating and chemical plant, and England now imports fifty million pounds' worth of meat per annum to feed her millions, and thrice that value of dairy produce, fruit, and vegetables, putting within the reach of her working classes a diet which in variety and cheapness can be shown by no other country. The stimulus to production all over the world which this development has brought in its train has been immense. The producing countries have found a market unobtainable in any other way, and have brought into cultivation millions of acres which must otherwise have waited untilled for generations, and with this food-producing industry

as a staple have been able in an increasing degree to embark in other industries. At the same time England herself, by the facility with which she has sustained an increasing population on an improving diet, has been stimulated to further industrial developments. In the words of Professor Marshall:

> The progress of the arts and resources of manufacture have benefited England more than almost any other country in one important but indirect way. It has so reduced the cost of carriage by land and sea that raw materials and food can come to her even from the centres of great continents at a less cost than they could come from the near neighbourhood of the sea-shores and great rivers of the continent sixty years ago; and the 300,000 miles of railways which have been built during the last sixty years in America, Asia, Africa, and Australia are rendering greater service to Englishmen than to any other people except those in whose lands the several railways are placed.

The outstanding fact of modern commerce is thus its international character, and to no one single cause is this more due than to development in transport. But its effect on trade within a nation, though less conspicuous, is no less important, and it is not to be forgotten that facilities for the interchange

of products even within one country are of comparatively recent growth; indeed, the greater inherent difficulties of land-transport, as compared with that by sea and river, actually made over-seas trade in some cases precede that by land. The network of canals and railways which now covers the face of each civilized country has therefore an enormous importance quite apart from export and import trade, and to it must be attributed the cessation of famines, of violent fluctuations in supply, and the facility with which all ordinary articles of commerce are obtainable over the length and breadth of a country at reasonable prices. In particular the concentration of large populations in single cities which, whether for good or ill, is so characteristic of modern life owes its very possibility to the developments of transport, without which the problems of food supply would long ago have placed insurmountable barriers to the growth of cities.

The Individual Producer.

The individual producer is interested in transport because the state of that industry

affects the extent of his markets and indirectly the cost per unit of his output. But in the general state of the industry of transport he is only thus interested as one of a number. All his competitors are affected in the same way, and there is theoretically nothing which affects him as an individual. He is also interested in transport as forming an item in the cost of manufacture,—as helping to determine the cost of his fuel, raw material, machinery, and other adjuncts of manufacture. But changes in these items, provided they are permanent, important, and impartial, do not directly affect him. For then they represent a substantial decrease or increase in the cost of production; if the former, the higher profit is wrested from him by force of competition, and is passed on to the middleman and thence to the consumer; if the latter, his profits, at first curtailed, are ultimately restored by an increase in the price paid by the consumer. The permanent result of alterations in the cost of manufacture, then, is limited to the indirect effect in the demand for his commodity and the result of that effect on the cost of production per unit.

But in actual fact changes in business may be far-reaching or they may not; they may be permanent or temporary; they may affect all producers alike or only those in one locality; they may not affect even all within one locality, but may be deliberately or accidentally partial in influence; they may be great or small relatively to the other items of cost and the aggregate cost. And it is in this irregularity, in extent, in time, in influence, that their importance rests. Moreover, economic friction counts for much, and to the individual may bring ruin or sudden prosperity. Now changes in the cost of transport are perhaps more easily produced than is the case with any other items of the cost of manufacture. Hence their economic importance to the individual producer. Consider a few hypothetical instances. Suppose that the completion of the Panama Canal or the opening of a new railway line gives certain wheat-growing countries or districts an enormous help in marketing their products, while it does not affect others. Suppose alterations in ocean freights benefit some countries, damage others—perhaps for one

or two seasons, perhaps for long periods. Suppose that a secret rebate understanding with the railway serving a district, such as that in the famous Standard Oil case (*vide* Ripley, *Railway Problems: Standard Oil Rebates*), gives one supplier an enormous advantage over others. Suppose that of two factories almost adjoining, one is just beyond the limits of a certain rate, the other just within it, so that one gets a substantially lower rate to the market or port. Suppose that a change in rates is sufficient to give the producer a substantially larger profit, but is too small to be passed on to the consumer, as would have happened if Messrs. Spillers & Bakers of Cardiff had won their case in 1903, when an additional profit of £23,000 per annum would have accrued to the firm with only a difference of one-eighth of a penny on each sack of flour! Suppose that if an alteration in retail price is undoubtedly called for, through some increase in the cost of transport, it is strenuously resisted by the retailer and consumer. In all these cases, the very irregularity, uncertainty, and temporary characters of changes in transport make them

of enormous importance to the individual producer.

We should expect, then, that the producer would be less interested in the absolute cost of transport than in relative cost, compared to his competitors in the same industry, or to competing substitutes. And in fact, as we shall see later on in greater detail, this is the case to a remarkable degree. Complaints as to rates are never, or hardly ever, of their unreasonableness, *per se*, but of inequalities, partiality, secrecy (a form of partiality), unfairness, and so forth. And it is because the railways complained of have usually been able to show that they have charged the same rates to all meeting certain conditions, that their action has so often been upheld.

Relations of Transport to Consumption.

We have seen that the division of labour and specialization in production imply production on a relatively large scale. Production on a large scale implies as its complement the necessity of correspondingly wide markets. For as supplies increase in extent they come under the action of the "Law of Satiable

Wants," according to which "the additional benefits which a person derives from a given increment of his stock of anything diminishes with every increase in the stock that he already has" (Marshall, *Principles*, p. 168). That is to say, they cannot be locally absorbed save at decreased prices. But with transportation facilities as developed nowadays, it is possible to market commodities over a wide area without heavy expense, and a large portion of the output is therefore despatched beyond the limits of the local market. The actual width of the market for any commodity is the result of several determining factors,—the value of the commodity, as compared with bulk and weight, the elasticity or otherwise of the demand for it, and the degree of development of transport facilities in the neighbourhood of its production. But it is clear that, broadly speaking, the extent of the market must correspond to the scale on which production is carried on. The two systems are indeed complementary, different aspects of the same type of organization.

Now the width of market affects consumers

through prices. When markets are small and isolated, prices vary widely in different places at the same time and in different times at the same place. For when we assume as constant the forces of supply and demand in any particular market, the price there is determined by the relative strength of these forces. In an isolated food-producing district, for example, the prices of food will be comparatively low in normal times, while in a large town without adequate transport facilities they will be comparatively high, even after normal harvests. Thus in the Middle Ages, Thorold Rogers tells us, the prices of food and other necessaries of life were dearer in London than in the country by 15 per cent, though now, owing to the unrivalled position of London as a centre of trade, the converse is the case. Or take the case of wheat at a later period. From 1800 to 1820 the price in England averaged 98s. 6d. per quarter. It was known that there were large districts around the Baltic and the Black Sea producing more than their own requirements, but these were some distance inland, and in the absence of railway facilities were economically beyond

the reach of England. In the next two decades, 1820 to 1840 (Marshall, White Paper entitled *Fiscal Policy of International Trade*), "the average price in England was about double that in the special wheat-producing districts in Germany and quite half as much again as in the industrial districts of Westphalia and the Rhine Provinces."

Further, the ruling principle that ultimately in the long-run prices are determined more by the cost of production than by supply and demand is less applicable in the case of food supplies than with other commodities, since in the case of the former the limit of possible supplies without increased price is determined by nature through the acres of land available for cultivation.

Such variations between different places are detrimental to all those concerned. It is true the consumer in all isolated food-producing districts can obtain his food supply at low cost. But in such a district nearly all are interested as producers as well as consumers, and in the former capacity far more largely interested. Moreover, in the case of those food products which can be preserved

without rapid deterioration, the demand is extremely non-elastic, and no matter how low prices may be, the consumer can take practically no advantage of them through increased consumption. In the case of other crops, such as fruits, vegetables, etc., the demand is only slightly more elastic, and in addition it is impossible to keep the commodities for more than a short time. On the other hand, the non-producing districts—usually the more populous—may suffer from the high prices they must pay, their disabilities varying in degree from inconvenience to the agony of starvation in famine times.

Indeed there is no more striking example of the beneficent effect of improved means of transport than their abolition or amelioration of famines. In England, where distances are small, and water transport is readily available at almost every point, this effect was produced before the advent of railways. But in view of the enormous growth of population it has only been maintained by the development of railways in other countries and of steamship communication; while in countries of long distances and with less ample means of

water transport, no agency save that o
ways could have effected the desired c
In the words of Sir Thomas Higham (*Im*
Gazetteer of India, vol. iii. p. 354) :

Railways do not, like canals, increase the food supply of the country, but they render possible the transfer of surplus supplies to parts which require them. . . . The smallness in the difference of prices in all parts of the country (India) during the famines which have occurred since 1896 is the best justification of the policy of railway extension as an alleviation of famine.

Further, in such isolated markets wide variations occur from time to time, most noticeable again in the case of food-stuffs through the dependence of supplies on harvest conditions. Thus for the period of 280 years from 1261 to 1540, while the average price of wheat in England was 5s. 11¼d. per quarter, actual prices varied from 2s. 10½d. in 1287 to 16s. in 1316, a famine year. In the two years 1315-16 the average price was nearly three times and on one occasion five times the ordinary price (Rogers, *Work and Wages*, small edition, chap. i.). It needs no argument to establish the results of such fluctuations in the price of staple food-stuffs. All classes of

society are affected directly or indirectly, and the poorer classes must suffer intensely. High prices spell poverty, disease, and perhaps death; low prices give a recompense by no means adequate, since personal consumption of the necessaries of life is a fixed quantity. Whereas, under present conditions, "ocean telegraphs and the increasingly cheap construction and efficiency of steam transport by land and sea have created a single wheat market for the two hemispheres with England as its focus" (Marshall, *ibid.*).

And the merging into one pool of all these supplies drawn from the United States, Canada, the Argentine, Russia, India, and Australia is as efficacious in modifying fluctuations in time as in space. In the somewhat harsh words of Thorold Rogers:

> Thanks to the efforts of those who established free trade in food, the farmer and the landlord are now deprived of the pleasure which they once felt when unpropitious seasons raised the price of food in so rapid and increasing a proportion that a scanty harvest was bringing enormously increased gains to the agriculturist and the receiver of rents.

The competition of these different countries all over the world, the different times of the

year at which their crops are harvested and marketed, the different wheat-belts of the United States and Canada, one following the other in order of harvesting, the wheat of Australia and New Zealand harvested in our cold season, the crops of South America harvested from November to February, those of India from February to May, all tend to steady prices during the year and to prevent their close dependence on proximity to or distance from one single harvesting time. Moreover, the very imperfections of transport have tended to the same end. The natural desire of railway companies and steamship companies to limit their capital expenditure on wagons and ships to a capacity almost equal to their average traffic has made it impracticable for producers to send all their grain to market immediately after harvesting. Thus have sprung up wheat elevators and warehouses, containing in the aggregate large reserves, the known existence of which exercises an important steadying influence on market prices.[1]

[1] It is dangerous to argue from particular years in regard to wheat. But the following figures of highest, lowest, and average

We have now to consider the absolute levels of price as distinct from marked differences and fluctuations in those levels. It is clear that if change occurs only in the width of market,—the aggregate amounts of the forces of supply and demand remaining the same,—the obtaining of a closer average price over the wider area must mean increased prices for some and decreased prices for others. But, as we have already seen, even if the average price remains the same, such a change is on the whole distinctly beneficial, for it is the more thickly populated districts which as a rule receive the benefits of lowered prices, and in the less thickly populated districts, themselves food-producing centres, in which prices rise, the loss is really not serious, being in respect of commodities the demand for which

prices in England at the beginning, middle, and end of the nineteenth century appear to indicate important decrease in fluctuations in time as in absolute price :—

Price of Wheat per cwt.	Highest.	Lowest.	Average.
1801	£29 18 0	£14 14 0	£21 0 0
1851	18 14 0	9 13 0	13 17 0
1889	11 7 0	7 14 0	9 5 0

is inelastic, affecting a comparatively light population, and one moreover the greater part of which has greater interest as a producer in obtaining a good price for the commodity they sell than as consumer in obtaining their own requirements at low cost.

But as a matter of fact, the general level of prices tends to fall with the wider market. This is so well known in the case of wheat in England that it needs no argument to support it. Not only is the average market price now less than half what it was before the growth of transport facilities and the repeal of the Corn Laws gave England the benefits of the world's supplies, but the result has been obtained in the face of a largely increased urban population, and one which has increasingly fed itself on wheat to the exclusion of the cheaper grains, oats and rye. Nor is the tendency confined to food grains. The price of coffee has fallen during the nineteenth century to nearly one-half, that of cotton, of silk, and of sugar to nearly one-third of its level at the opening of the century.

And if it is permissible to leave the objective standpoint of market prices, and to consider

the result on the individual consumer, it is clear that the increased benefit to him, as measured by pleasurable and interested feelings, is much greater than is indicated by mere prices. For it is not the staples of life which yield the most pleasure. It is true they are the most necessary, and if "Consumer's Rent" is measured by the difference between the prices paid and the prices which the consumers would pay rather than go without them, it is greatest in their case because with them it approaches infinity, being limited only by the absolute ability to pay. But as a matter of fact, the monotony of these articles renders them uninteresting, so long as their purchase at a moderate price is secure. It is the little luxuries of food, of dress, of ornament, of recreation, which yield pleasure quite out of proportion to the amounts spent on them. Now it is in these that the most marked changes have occurred. Developments which place within the powers of the humblest little luxuries like fresh fish, grapes, even pineapple, short trips to watering-places and so forth, have had a marked influence in improving the conditions of life for the masses.

Generally speaking, therefore, it is not too much to claim that modern developments in transport have had an economic effect second to none in regard to the conditions of consumption. It is needless to say that they alone would have been useless, even if they could have come into existence at all, without corresponding developments in production all over the world, and it would be dangerous to over-emphasize their importance to the disregard of the latter. At the same time they formed an absolutely essential part of the system, without which no developments in the processes of production could have become economically effective. The necessity for them was therefore absolute.

THE INDIVIDUAL CONSUMER AND THE MIDDLEMAN.

In discussing the relations of transport to the production of commodities we saw that the individual prosperity of producers was less affected by the absolute cost of transport, since this to a large extent could be eventually shouldered on to the consumer, than by

differences in its incidents, which affected his position prejudicially or otherwise in relation to other producers. Hence the producer's protest was usually raised against inequalities and unfairness in transport charges.

The relations of transport charges to consumption are different. It is the consumer who ultimately and permanently must pay all the necessary costs of the articles which he consumes, including all necessary expenditure incurred in transport. A material and permanent increase in such expenditure therefore affects him adversely, not only directly by the actual extra cost of transport, but also indirectly by restricting production, by rendering *hors de combat* the marginal area of supply which was only just able to compete in the market under the old transport charges. On the other hand, real diminutions in the cost of transport help him directly, reducing prices by part or whole of such diminution in cost per unit, and also indirectly by stimulating production, improving the strength of the forces of supply, and lowering the cost of production per unit. It is of course true that there are so many factors affecting retail

prices that it is doubtful whether changes in the cost of transport, which for the consumer is merely an item in the process of production, will always reach him, or if they do will be recognizable, confused as they are with the varying wholesale prices of different localities, different makers, and different qualities of similar goods, and the prices and the profits of wholesale houses and retail shops. On the other hand, there is no branch or trade in which there is less economic friction than in retail trade. The laws of economics necessarily force both producer and middleman into the hands of the consumer.

The former are interested in the production and marketing of one or more commodities, usually of somewhat similar character. Their whole business interests centre on their commodities, and the keen competition of the producers and middlemen forces them to give the best possible terms in order to market the maximum amount. On the other hand, the absolute freedom of the consumer in well-developed centres to purchase on the best possible terms helps him to take advantage of this state of affairs and to get the best value

for his money. Thus he is usually secured in the enjoyment of all considerable reductions in price arising from improvements in transport, save when artificial barriers intervene in the shape of import duties.

The middleman, whether he be warehouseman or retail shopkeeper, is substantially the same. On the one hand are comparatively wide streams of production from farm and factory of commodities of similar nature; on the other are the consumers, each with a schedule of demands for small quantities only but for a vast variety of commodities. The middleman takes the produce of many producers either in part or in whole, and then from his stores is able to fill the varied schedules of demands of the different consumers. He is necessary, because without him either the producer must have his own separate organization extending in every direction until the ultimate consumer is reached, or the consumer must have his extending to the real source of every product which he consumes,—and from their one-sided character either organization would be cumbrous and prohibitively costly.

Now the profits of the middleman naturally depend on the extent of his business, and on the amount of the profit per unit of business transacted. In both respects he is dependent alike on the producer and on the consumer, while both extent of business and proportion of profits are determined by his competitors. Production on a small and simple scale argues little or no necessity for a middleman. Similarly with consumption. When both exist on a scale sufficient to justify the employment of middlemen, there then sets in competition between different middlemen. But in addition the middleman is prevented from obtaining excessive profit by reason of the limit to the value of his services and the possibility of producers getting into direct touch with consumers rather than pay him an excessive charge. It is characteristic of the middleman's business, therefore, that the profit cannot easily be excessive per unit, for monopoly is beyond his reach. It must therefore depend chiefly on increasing the extent of his business in order to increase his aggregate profit. He is therefore intensely interested in transport facilities which may

extend the consumption of articles by placing them on the market at lower rates or by introducing them to markets hitherto untouched.

BOOK I

RAILWAY TRANSPORT: PRODUCTION OF

CHAPTER I

COMPARISON WITH OTHER FORMS OF TRANSPORT

The four main forms of modern transport are by road, rail, river or canal, and sea. In all four forms we may distinguish three factors: (1) the construction and maintenance of a prepared way and connected plant and terminals; (2) the provision of motive power; and (3) the provision of vessels or vehicles for the things transported. In the case of road transport, the road is now almost universally the work of the State, being constructed and maintained either by the central or district government, and its maintenance is paid for indirectly by a general tax. The provision of motive power and vehicles for use on roads is the subject of free competition. With railways, the three elements are combined under

one administration, which may be directly State-controlled or may be the result of limited competition under State regulation. In the case of rivers and canals, the channel itself is usually the property of the State, or of some public or semi-public body, while the provision of motive power and vessels is the subject of free competition. Lastly, as to maritime navigation, while the ocean itself is provided and maintained by nature, and is free from the interference of any State, the different adjuncts of the sea, which in practice are necessary for modern maritime transport, viz. lighthouses, harbours, docks, etc., are provided by public or semi-public bodies, while the motive power and vessel are the subject of free competition.

In each case it will be seen the *way* of communication is to some extent regarded as part of the public domain or, in legal language, the "eminent domain." And it is clear that this must be so, for its construction and maintenance necessitate the control and adaptation of part of the public domain, such as the sea-coast, harbours, estuaries and rivers; the purchase of privately-owned land and

property for the artificial part of the work; and incidental interference with private rights, pleasures, and conveniences, *e.g.* by the alteration of the country-side, the utilization of water for rivers and canals, the noise and smoke of railway engines and trains and so forth. Thus their inevitable dependence on the State necessitates their being regarded as under its surveillance. In addition, their necessary limitation in number constitutes them to some extent monopolies, and on this ground also in need of Government control. Indeed, in a country like England, transport undertakings are typical monopolies, and it is significant to find that in the list of monopolies given by Sir Thomas Farrer in his book *The State in its Relation to Trade,* which runs as follows:

> Harbours and natural navigations, canals, docks, lighthouses, roads, bridges and ferries, railways, tramways, gas-works, water-works, the post-office and telegraphs,

all save two are connected with transport.

But there is this important difference between railways and the other means of communication, that the remaining factors

other than the way itself, viz. provision of motive power and vehicles or vessels, is with the latter the subject of free competition. Harbours, docks, rivers and canals are open impartially to all vessels fulfilling the necessary conditions as to size and weight, and the tariff of charges is simple and impartial. Roads are similarly open to all, and the necessary charges are borne by so many, and are relatively so small, that for convenience sake they are levied in the form of rates and taxes distributed irrespective of the amount of use made of the roads by the different payees. There is free and unlimited competition in the provision of power and vehicles, and all are at liberty to enter the ranks of carriers if they are not satisfied with the service offered them. Thus, while the way itself—whether harbour, dock, river or canal, or road—is a monopoly limited only by the competition of other similar undertakings, this fact has little effect on the services offered to the public, since the charges made for the use of these facilities are relatively low, and their impartiality is so absolute that all carriers bear exactly the same burdens. On the other hand, there is

effective competition in regard to the actual service of carriage, and the charges for it, and the public have all the advantages which such keen competition gives, unless indeed the competition becomes suicidal and is replaced by a mutual compact or agreement. Each alternative has its advantages and disadvantages. A service open to free competition is apt to display rapid and important fluctuations in the services offered, and in charges made for the same services, following on fluctuations in supply and demand. For while cost of production and competition together tend in these industries (as in all) to keep prices to a steady level, it is characteristic of the more elaborate means of transport (especially maritime) that the supply cannot be rapidly altered, and any alteration in demand is therefore apt to be reflected by a change in price until the forces of supply can be increased.

On the other hand, railways—although at first sight less monopolistic in character, especially in England, where they have been constructed and worked from the earliest time without Government aid or guarantee—are

really more so. For although it was at first thought that they would take up a position exactly analogous to canals[1]—the owner or constructor merely charging a toll for the use of the line, and leaving the provision of power, of vehicles and responsibility as carriers to private parties—it was soon found that this was impossible in practice, that such a division of functions meant risk of accident, delay, and great lack of economy in working. Hence, the three functions were early united under one administration, usually, of course, that of the company which owned the line. Thus in the case of railways, the service of providing the way of communication (for which in the case of other forms of transport some uniform charge is found a proper and suitable payment), and that of providing the power and vehicle (for which in the case of other means of transport the price is determined by cost of production, acting under conditions of free competition), are combined

[1] In 1801 railways were authorized to charge tolls for the use of their roads. In 1833 the railway administrations were recognized as carriers, but it was not until 1845 that they were allowed to levy one inclusive charge to cover the use of the road, of locomotive, and vehicle and responsibility for carriage.

under one administration, which levies one charge for the whole service. We shall have occasion to make further reference to this in discussing the rationale of railway rates and fares. In the meantime it is mentioned in order to show that the merging of the three different functions makes the railway administration the holder of a powerful though limited monopoly. For it alone can use its way, it alone can undertake the work of carriage, it alone can provide power, and (with some exceptions, of which England provides the chief examples) can provide carrying capacity. Hence to the extent that they have distinct advantages over other forms of carriage—and this extent is usually considerable in respect of safety, speed, and often economy—railways are owners of a monopoly.

As, however, their construction and working is only possible through their obtaining from the State powers as against private rights, they are clearly liable to regulation by the same State authority which granted them their powers, and the rights of the State to regulate railway working have never been seriously questioned. These rights are of two

kinds—those of police and those of public economics.

The former turns on the fact that the conveyance of persons and goods on railways is attended by some risk to the life and property of the railway employee, the travelling public, and the general public. Hence the State exercises technical supervision over the construction, maintenance, and working of railways, demanding the attainment of a standard of security by excellence of workmanship and the employment of recognized safeguards. In this capacity the State is merely exercising its functions as police, and fulfilling its implicit duty of preserving the safety of its subjects.

The second function turns on the monopolistic powers which the unified management of railways renders characteristic of them. It is recognized that the rates and fares charged, if not reasonable in relation to cost of production and profit, impartial and easily ascertained, might act in restraint of trade. It is further possible that the public might suffer from refusal or delay on the part of railways to grant all reasonable facilities.

Therefore the State, recognizing that the influence of competition is not sufficient, and relying on its rights as the giver of the monopoly, preserves powers of regulating the services given by railways and the payments demanded by them. These powers were well stated in the "Standard Oil" case: "Among these (obligations) is the obligation to carry for every person offering business under like circumstances at the same rate. All unjust discriminatious are in violation of the (*sic*) sound public policy and are forbidden by law."

CHAPTER II

CHARACTER AND CONSTITUTION

RAILWAYS have to compete for the land-transport of the world against roads, rivers, and canals. Their superiority over roads in respect of the cost of haulage is very marked, and in respect of celerity even more so. These advantages are derived from the much lower frictional resistance. At the average speed of a slow goods train, 20 to 25 miles an hour, the tractive effort required on a level railroad is only from $\frac{1}{5}$ to $\frac{1}{10}$ of that required for wheeled carriages on roads. Hence the power necessary to haul a given load on a level railway is only a fraction of that necessary on a level road. Further, when and where animal power only is available for road traction, a further economy results from the lower cost at which a given power can be

provided by steam. But in civilized countries steam, petrol, and electric powers are now available for use on roads in convenient and economical forms, and this advantage no longer remains to the same extent. Indeed, the freedom of road-carriers from all charges save those incurred on the vehicle itself leaves them in a much stronger competitive position, especially for light roads and shorter distances. Nevertheless the very heavy depreciation which the greater vibration which an ordinary road involves still leaves an advantage with railways in the cost of haulage pure and simple.

At present the cost of running a petrol-driven omnibus or wagon with a given load up to $2\frac{1}{2}$ or 3 tons is probably under favourable circumstances anything from 4d. to 8d. per mile. The cost of a goods train of about 200 times that capacity is not more than five or six times that amount. In celerity of movement the advantage is entirely with railways, reckoning from start to stop in both cases ; even if it were not necessary to limit road vehicles to slow speeds in order to safeguard the public safety and comfort, it would

be impossible on economic grounds, through the increased vibration, to run them at anything like speeds customary on railroads. Other descriptions of road transport having less mechanical efficiency are a fraction further behind in the race. Those countries and districts which are dependent on pack animals find the prices of commodities transported appallingly high in consequence. Take for example the case of Persia. It is calculated (*Indian Trade Journal*, July 1908) that the actual cost of transit by steamer and caravan from Bombay or Karachi *via* Bunder Abbas to Kirman for a load of 650 lbs. was Rs. 72, whereas if the land journey could have been made by rail at Indian rates the cost would have been Rs. 4½ only. Hence goods costing 16½ lacs of rupees in India were worth 27½ lacs at Kirman. Further, the caravan journey took eighty days; by train two days would have been sufficient.

But from a practical point of view we must take times of transit, not simply from start to stop of the moving vehicle, but from door to door—from consignor's to consignee's hands. That is to say, we must reckon in all the

time occupied on the receipts, classification, accounting, and waiting for the making up of loads before the journey commences, and the converse operations, including delivery at the other end. Here the advantage is with the smaller organization at every point. Hence, when the journey itself is short and these auxiliary operations occupy a time longer in proportion to the duration of the journey itself, the advantage of railways in speed rapidly diminishes, and for very short distances becomes negative. As is well known, the shorter parcels services of the Postal Department are now carried on by motor vans. And many private delivery firms have organized excellent road delivery services which compete actively against railways. But this competition is confined to smaller and lighter vehicles, and small consignments.

To sum up, railways hold their own as against road traffic for (1) heavy articles and large consignments for all distances, (2) all articles for longer distances.

The relations of railways and internal navigation are somewhat more complex.

First, as to costs of working. In the case of rivers, expenditure on the way and works is small and is often undertaken by the State, so that it is not possible to make a fair comparison of its cost of maintenance with that of a railway. In the case of canals this expenditure is generally heavy, but varies enormously according to the nature of the country. In Holland, a small and deltaic low-lying country, it has been comparatively low; in England, on the whole a hilly country, especially in its busier districts, and with an elaborate network of roads and railways, the many locks, aqueducts, and bridges which have been necessary have made the expenditure enormous. France, perhaps, occupies a midway position, yet an impartial observer, Colson, has pointed out that the French railway lines cost altogether an average of £27,520 per mile, and that this rate would be below the cost of constructing a not particularly expensive canal. The same writer in comparing costs of haulage proper arrives at the result that transport by goods train—taking its load at 300 tons—is about ·6 to ·8 centime per ton kilometre, while

by canal it is about 1 centime. Thus there is reason to believe that the supposed greater economy of waterways is doubtful in most countries, and is non-existent where waterways have been costly.[1] This is borne out by the ease with which railways have ousted water-traffic in England, in India, and in parts of the United States. In England the Kennet and Avon Canal, which in 1840 paid 5 per cent, gradually lost its traffic after the opening of the Great Western Railway between Reading and Bath in that year, and by 1845 its receipts had fallen by £62,000. The canal was only transferred to the Railway Company in 1851. In India, where Government holds by far the predominant interest in both internal navigation and railways, the results have been the same. Sir Thomas Higham says (*Imperial Gazetteer*, iii. p. 363): "The fact that the construction of a railway

[1] In this connection the following extract from a daily paper (*Daily Telegraph*, April 1909) is of interest: "In America recently one of the best known experts stated that from comparative investigations of the cost of working canals and railways he is not prepared to support broadly and without material qualifications the popular impression that transportation of freight by inland waterways in general is less expensive than transportation by railways."

causes a very serious diminution in the volume of previous canal traffic, indicates that the lower cost of haulage on canals cannot in many cases be set against the other advantages which may be claimed for railways." In the United States the Erie Canal has lost much of its importance since the consolidation of the New York Central, and it has been asserted that "to-day its traffic is a practically negligible quantity." In France the increase in traffic has been at about the same rate for both means of transport, but the quantities are much greater in the case of railways. The figures are from 1·83 millions (of ton kilometres) in 1872 to 5·1 in 1906 by water, and from 7·72 to 18·4 millions over the same period for rail. In Germany the traffic per mile has increased since 1875 from 410,000 tons to 740,000 tons; on waterways from 290,000 tons to 1,150,000. But Germany, rightly or wrongly, has not yet developed her railways as she might have done, and the density of her railway traffic is low for such a highly developed country.

Any comparisons with water transport as to celerity are, on the whole, strongly in

favour of railways, and the advantage increases with distance. The number of locks on the waterway are an important factor. In Holland, the short distances and the common levels and excellent working of her canals make it possible to carry on a daily or rather a nightly service from many country places to the large towns of Amsterdam and Rotterdam, and 90 per cent of her total goods traffic still goes by water. In other countries the smaller dimensions of water traffic, and still more the smaller carrying unit and its comparative independence of others, tend to strengthen the position of water transport. But broadly speaking, the advantage in speed when moving is (and must ever be, from the destroying effect on banks of high speeds in narrow channels) entirely with railways. There is also much greater immunity from damage by water and loss by theft.

Water transport has some superiority in the greater ease with which it can deal with increased traffic, but it has greater drawbacks in the closer dependence on natural features, often necessitating more devious routes; the greater difficulty of connections, especially

cross-communications with other systems; greater difficulty in building "feeders"; and hindrances to traffic from frost on the one hand, and drought on the other. Railways, on the other hand, are not only more independent of "weather," but their much more artificial character makes them more independent of the contour and configuration of the country. They can be carried almost anywhere at a price, and it is significant that there are now places, for instance, on the summits of the Rockies and Andes, where railways have been or are being constructed but where no carriage-road has ever been attempted.

A similar comparison between railways and maritime transport presents great difficulty, arising from the fact that they are on the whole complementary rather than competitive. This is clearly the case with maritime transport over the oceans and the larger seas. Here there can be no proper comparison, because the work can in any case only be done by one party to the comparison. But it is possible to say that broadly ocean transport has the advantage in greater cheapness owing to very small expenditure on "way

and works" and is without most of the disadvantages of internal water transport just enumerated; while on the other hand there is a distinctly slower average speed and greater risk of loss or damage, with some limitations as to the size and shape of the articles which can be entrusted to the care of ships. In the case of coasting vessels, on the other hand, there is distinct and severe competition with rail transport, and this competition exists also with ocean services which do not merely bridge the seas between two countries but also continue their voyage some distance along the coasts of one or both of the countries concerned. Even in the case of vast continents like North America, the competition by steamer *via* Mexico or *via* the Panama Railway, or even *via* Cape Horn is an important determining factor in transcontinental railway rates. And this competition will become even more important with the opening of the Panama Canal, for at present the excessively high rates charged over the Panama Railway go far to lessen its intensity.

At the same time the reality and importance of their competitors does not in any great

degree diminish the importance of railways. They still occupy, and, so far as one can see, must continue to occupy, a predominant position in internal transport. Their aggregate importance is enormous, as judged by the investment of national capital which they represent, as aids to the productiveness of nations, and as a means of the distribution and cheapening of commodities. As to the capital invested in them, their importance in the four greatest manufacturing and most highly populated countries of the West are shown below:

Country.	Railway Capital.	National Capital.	Percentage.
United Kingdom	3740 millions	42,300 millions	8·8
United States .	5780 ,,	50,340 ,,	11·4
France . .	2400 ,,	39,200 ,,	6·1
Germany . .	2270 ,,	30,700 ,,	7·1

As factors in national life their place is shown in the periodical returns of traffic which are accepted by financial authorities as forming —along with Bank deposits and trade returns —one of the best indications of the buoyancy or stagnation of national trade and industry.

Turning now to the question of their

constitution, they are unique among the great industries of the world by reason of their unified management. Not only do they, and must they, carry out themselves by their own capital, labour, and organization the whole work of the production of railway transport, but they must also undertake its distribution and sale in large or small quantities to the consumer himself. They are, in other words, their own middlemen, insurers, and retailers. The only function they could well hand over to other factors would be that of insurance, but their ordinary risks bear such a small ratio to the extent of their business that this element is not of great importance and is invariably undertaken by themselves. In these respects they differ not only from other great industries, such as agriculture, or the production of iron and steel, but even from the other greatest form of transport—maritime. For shipping companies neither collect nor distribute their traffic, nor do they as a rule themselves undertake—at all events, unaided—the insuring of all their risks, which are greater absolutely from the greater dangers of the sea, and make themselves

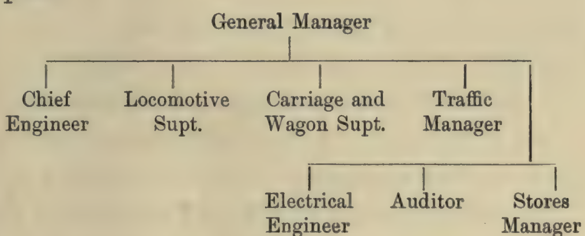
felt in greater units. These comprehensive functions of a railway are a necessary consequence of their constitution and the nature of the commodity in which they deal. This will be clearer from an analysis of their constitution.

The organization of a railway may be divided, firstly, into the technical and the non-technical departments. The former are the engineers of all kinds—civil, mechanical, and electrical—who provide the way, works, locomotives, and-rolling stock, and maintain, repair, make, and, in the case of engines, work them. Thus their sphere of activity is the provision and upkeep of all the mechanical and material aids to railway transport. The function of the non-technical department—called the traffic department—is to take all these material things and to evolve from their manipulation the commodity of railway transport. The line of demarcation is sufficiently clear, and it is well marked in practice.

The engineer is a specialist in one or more branches of engineering, who has received definite training and has often passed recognized tests as evidence of adequate tuition.

The traffic man has occasionally had technical training or experience, but in most cases he depends chiefly on practical experience of the work he does, obtained from a comparatively early age.

The two classes of staff may be co-ordinated in one of two ways. The older and perhaps the most widely adopted method is the simple one of ranging all departments alongside, as of equal status though varying importance, under one nominal head. The chief departments might be represented by the following plan:



the head of each department having directly responsible to him his deputy, district and assistant district officers and all staff subordinate to them, and himself being directly responsible for all matters belonging to his department to the general manager. In the

modified form of this arrangement now commonly adopted in England the traffic department is divided from top to bottom into the transportation and commercial sections, the heads of which are directly responsible to the general manager.

This method, however, is clearly *not* a logical sequence from the primary classification into technical and non-technical departments. It regards all departments as of similar status and sphere, whereas they are not. One department, and one department alone—the traffic department—is directly concerned with the production and marketing of the commodity which the industry exerts to produce. On the other hand, the technical departments, if in the employ of other industries, would perform very much the same duties as they do for the railways with which they are connected.

The more logical method, therefore, is to act on this important distinction and to base the co-ordination thus :

- General Manager
  - Superintendent of Transportation or of the Line
    - Supt. "A" District
      - Engineer "A" District
      - Loco Officer "A" District
      - C. & W. Officer "A" District
      - Electrical Engineer "A" District
    - Supt. "B" District
      - As at "A"
    - Supt. "C" District
      - As at "A"
  - Commercial Manager
    - District Staff
  - Auditor

Under such a system the technical departments, while supreme within their limits, would act under the instructions of the non-technical department for which in a sense they exist. This system has influential adherents and is said to work well in some countries. It is doubtful, however, whether it is on the whole advantageous. There are obvious difficulties in co-ordinating the district technical officers with their chief technical officers, and also possibilities of friction between the technical departments and the traffic department.

But whatever system of co-ordination is adopted for the technical and traffic departments is of comparatively small importance

here. We will therefore pass on to the constitution of the traffic department itself.

This department comprises two functions: (1) that of the movement of consignments—the production of the commodity of transport; (2) that of its retailing, its distribution and supply to those demanding it. The latter function is, as we have seen, usually left in other industries to independent agents, middlemen and retailers. In direct connection with (1) there are all the technical departments, and belonging to it there are all those members of the traffic department who do not come in touch with the public, that is to say, all the goods guards, signalmen, pointsmen, yard staff, and accounting and bookkeeping staff. The second class includes all those who do come into touch with the public, viz. commercial managers, goods and passenger agents, booking, goods, and parcels clerks. Passenger guards are anomalous and belong to both sides. The distinctness of the two classes is well marked in the case of all the subordinate staffs, but in the case of supervising officers there is more complexity. On some lines, the two functions are combined in one district or

assistant district officer. But there is now a marked inclination on the best-managed lines to separate the functions as much as possible, uniting them only in the person of the general traffic manager or superintendent. This variety in organization corresponds to a real fact, in that there must be a considerable merging of the two functions in practice. The nature and extent of the arrangements made for moving traffic clearly must depend on the nature and amount of that traffic. On the other hand, the traffic will be limited or encouraged by the facilities offered. Hence in the more detailed examination of the economics of the two sides we shall throughout find constant interplay.

CHAPTER III

CONSTRUCTION: PRELIMINARIES

A CAREFUL and considered estimation of the economic basis of any railway—which is necessary to an understanding of its position and value—should be also an actual preliminary to its promotion. For upon the best possible estimate of the nature and quantity of traffic which can be arrived at must of course turn the decision as to whether a line is to be built at all, and also the decision of its proper character within the limit of such variation as is in practice possible. The estimate of probable traffic turns partly on the economic position of surrounding districts or countries, and partly on that of the district or country directly concerned, inasmuch as the traffic will ordinarily be of two kinds, that crossing the boundary of the district—export and

import—and that within the district. Export traffic will depend upon the margin between prices at places of production within the country and the demand prices at the boundary; import traffic on that between supply prices at the boundary and the demand prices of different consumers within the district. And there will, of course, be a constant interaction of the two movements. As to purely internal traffic, its amount and kind will similarly turn on the margin between supply prices and demand prices at different places. And there will also be interaction between the two main classes, traffic crossing the boundaries, and that within them.

It is sufficiently clear that any accurate estimation of traffic will be a matter of exceeding difficulty, more particularly by reason of the sensitive nature of demand, and the uncertainty as to how elastic the demand for any commodity will prove in response to alterations in its price. This difficulty in forecasting traffic would exist in regard to any kind of transporting agency, but in the case of railways it is complicated by their main characteristics. Railways are essentially

big things, involving huge capital expenditure with heavy interest charges, large expense in maintenance, and still larger in working. To pay even the prime cost of haulage they must deal with a very large traffic, to pay fixed charges and yield a fair profit that traffic must—as judged by all other standards—be immense. And this is very largely so, even with a small-gauge line, though, as we shall see shortly, some reduction is possible in this direction. There is, then, no *via media*—there must either be a case for a railway or no case at all. There can be no justification for a small beginning—afterwards to develop under favourable circumstances into a great corporation—as has happened with many a large steamship or road-carrying company. It is simply a question of whether the large business necessary will come. If it does, fair success is assured; if it does not, no success at all is possible from a dividend-earning point of view. Clearly, then, railway promotion is usually somewhat like leaping in the dark, and it will be interesting and instructive here to consider certain typical examples of railway promotion and the results attained.

Liverpool and Manchester Railway.—This was the case of a line connecting one of the greatest seaports in the world with a large town already celebrated as the head of the cotton-manufacturing industry of the world. The population of Liverpool and Manchester was already large, and the intervening country was fairly well peopled and distinctly prosperous. There was therefore a favourable case. The results amply bore out the prognostications of the most sanguine. While in 1830, before the line was opened, stage coaches carried an average of 450 passengers between the two towns at 7s. 6d. per head, in 1835 (the line was opened in 1830) the railway carried over 1500 a day at a charge of 5s. The coal traffic increased from 2889 tons in the first half of 1831 to 222,848 tons in the first half of 1836.

Belgium was even at that time a thickly populated and prosperous country and had the additional advantage of similar neighbours. There railways met with immediate and unqualified success. In Belgium the passengers carried increased from 871,307 in 1836 to 3,085,349 in 1843, and the gross

receipts from £35,075 to £359,777, the mileage having grown during this period from 27¼ to 326¼ miles.

Holland might seem to have offered an almost equally attractive field, possibly an even more attractive one, when we consider its great international traffic due to its possessing the natural entrepôt of much of Germany's trade. But as a matter of fact, the elaborate and universal system of water carriage in Holland made the success of railway enterprise there a most difficult matter. In 1844 the first line to be undertaken in Holland was still uncompleted. Nine-tenths of the capital of the company which acquired and completed it was raised in England, and at the end of the fifties matters are thus described (E. A. Pratt, *Railways and their Rates*, pp. 273-4): "It had neither capital nor credit, it provided practically no accommodation, and was regarded with general antipathy; the traffic, local or international, was all going by water, and 700 trucks for which no use could be found stood rotting and rusting on the sideways at Utrecht."

The *United States*, on the other hand, were

far behind Europe in density of population and accumulated wealth. But they possessed — especially the eastern States — enormous growing power, a vigorous, intelligent people, and great natural resources, and the first lines constructed showed rapid progress and yielded high dividends. Thus the result was the same, though "while England developed her railways, the United States were developed by hers." The line from Camden to Amboy in New Jersey showed at the end of six years of working a gain of 65 per cent in passenger traffic and 113 in goods, and the aggregate net receipts for the period actually exceeded the cost of the line. Similarly the line from Syracuse to Utica—53 miles long—within a few years was paying 35 per cent on its cost.

The case of *India* is one of considerable interest. Here was a country which indeed was thickly populated, but where both the cost of living and the average rates of wages were low, as judged by Western standards, and the accumulated wealth of the nation small in proportion to the population. Hence India had to rely on capital from outside, but the history of railways in India, though

not without its vicissitudes, has on the whole been one of extraordinary success[1] notwithstanding special evils—close dependence on a very variable rainfall and most serious fluctuations in the value of silver—to contend with.

Ireland in the early days of railways was not densely peopled, and had no large industries save agriculture. Nor was there much accumulated wealth. Under these circumstances the results of railway construction, which was expedited as a means of better combating famine, were not successful. The Royal Commission appointed in 1844 showed that there were fifty-six lines, but the total mileage was only 1800 miles, and many lines did not extend 10 miles. Their general financial condition was deplor-

[1] The following figures are taken from the *Administration Report on Indian Railways* for 1908 :

Year.	Mileage.	Capital in Rupees.	Gross Earnings in Rupees.	Net Earnings in Rupees.
1853	20	37,00,000	90,000	49,000
1863	2,507	53,00,000	2,20,00,000	87,00,000
1873	5,697	91,72,00,000	7,22,00,000	3,09,00,000
1883	10,450	148,30,00,000	16,38,00,000	8,41,00,000
1893	18,465	232,66,00,000	24,05,00,000	12,72,00,000
1903	26,851	341,11,00,000	36,00,00,000	18,89,00,000
1908	30,576	411,91,00,000	44,82,00,000	17,82,00,000

able, two lines were bankrupt, two at a standstill, several had paid no dividend for years: only one line—a metropolitan railway 6 miles long—was a commercial success. The total weekly receipts on all the Irish railways were only equal to those for two and a half days on one single railway in England.

Of the six examples taken, four show successful results from the outset, and two comparatively unsuccessful. Each of the former refers to a well-populated country, and two of the four to countries which had the additional advantage of considerable accumulated wealth. Of the two latter, one referred to a well-peopled country—Holland—but there railways had to fight their greatest competitor, water transport, under the most unfavourable circumstances possible.

The examples are perhaps sufficient to show the difficulty of laying down any principles of action in regard to the estimation of traffic. If any generalization at all can safely be made, it is one which is also a truism, that the prospects of success, in the absence of extraordinary competition, bear some vague proportion to the intensity and

wealth of the population, or to the rapidity with which these are increasing. But even this needs qualification.

For the successful promotion, construction, and operation of a line in a populous and wealthy district is not assured by the existence of a good case for it. This work is such a gigantic one that it demands great capital, and capital is sensitive and capricious in proportion as it is great. In the markets of the world much depends on the psychological facts which are summed up in the word "credit," and it is characteristic of credit that it does not run equally along a median line, but by an alternation of contractions and expansions, rises and falls, booms and slumps. When trade is brisk, the money market is sanguine and buoyant, and credit is easily obtained,[1] even for indifferent and positively bad schemes. When trade is dull, prices are contracting, and money is hard to obtain even for excellent schemes. Thus, with

[1] Of course the price paid for accommodation is higher when money is in brisk demand, but this affects rather temporary accommodation than large undertakings. And, moreover, a period of brisk trade is usually followed by a period in which demand may be less keen, but in which there is abundant freshly-made capital available and demanding suitable investment.

a good case, promoters may have to wait for their money—which itself involves loss of money and prestige—or worse still, to complete their line with less than the essentially necessary capital, an alternative which, besides being bad in itself, is apt to hamper future working with unnecessary additional expense.[1]

Lastly, there may be failure arising from dishonesty and divergent interests causing an hiatus between the successful promotion and the successful construction and maintenance of a line. For the ultimate owners are not those directly concerned in flotation, and it is unfortunately quite possible for interests to diverge, and for a line to be promoted and

[1] As showing fluctuations in railway construction the following figures for Great Britain are interesting:

Years.	Railway Acts.	Miles sanctioned.
1801 to 1840	299	about 3000
1841	19	15
1842	22	67
1843	24	91
1844	48	797
1845	120	2883
1846	272	4790
1847	184	1663
1848	83	about 300

The English railway speculation reached its climax in 1845. For the United States see the figures and instructive graphs in Webb's *Economics of Railroad Construction*, pp. 4-9.

started with satisfactory results to the promoters, but with indifferent prospects of success as a dividend-paying line. Indeed, instances have occurred where the promoters have never expected their line to be successful, but have initiated it as a species of blackmail. But the possibility of this occurring argues inefficient State control. Where the investigation of the State is ample and impartial, it undoubtedly tends to secure the railway investor, and he is then less likely to be beguiled than in other industries.

CHAPTER IV

GAUGE

In a country as yet untouched by railways the question of gauge is a somewhat open one. Clearly a leading consideration is the amount of traffic, and we have seen that one of the most essential preliminaries of the promotion of a railway is some estimate of the probable traffic, immediate and future. This traffic must be separated into its main streams, and roughly chosen lines of route decided on accordingly. It may then be divided up between the two possible directions, and some daily average of probable traffic in each direction arrived at. The next step is to consider the probable traffic in relation to all the available knowledge regarding the respective mechanical efficiency and safety of different gauges, their cost in construction

and maintenance, and their estimated carrying power.

Finally there is the financial position. If the country concerned is relying entirely on its own resources, the promoters have to consider the general financial position within their State and the particular position and credit of their project. If it is hoped to draw capital from outside, the general financial state of affairs in the main leading capitals of the world must be taken into account, and the prestige and position which their country and their project enjoy in those places.

Even after full use is made of these determining factors, the result will be doubtful. For the first and third factors are of a nebulous character, while the second does not in practice furnish the precise and definite help which might be expected, because when once a decision is come to there is little interest or profit in seeing whether or no it was a mistaken one, so that information on the subject is scanty. In fact, when the first gauge (4 ft. $8\frac{1}{2}$ in., and that which in consequence of its first adoption is now most

widely prevalent) was chosen, no technical experience at all was available, and it is therefore not surprising to find that it was, as a matter of fact, determined quite arbitrarily, being indeed that of the original wooden way at the Northumberland colliery, and determined therefore by the dimensions of the English draught horse!

The influence of this pioneer gauge, though thus arbitrarily arrived at, has been very great. It was followed on the Continent in the countries which first took up railway construction, Belgium and Germany, and now almost exclusively holds the field in Europe. Russia, however, has a 5 ft. gauge, and Spain 5 ft. 5¾ in. In the United States there was at first very great diversity, to which the vast size of the country and the loose nexus which constituted the union then contributed. But the evils of the breaks of gauge were soon realized with the growth of trans-continental traffic, and the question was grappled with heroically. In 1886 all the gauges then existing—6 ft., 5 ft. 6 in., 5 ft., 4 ft. 9 in., and 4 ft. 8½ in.—were converted to 4 ft. 9 in. or 4 ft. 8½ in.; nearly 15,000 miles being so

converted in two days.[1] At present about three-fourths of the world's railways are on the 4 ft. $8\frac{1}{2}$ in. gauge.

Detached continents and islands have been free to follow their own fancies in the matter, and the results as a whole can only be called unfortunate. India has two principal gauges, 5 ft. 6 in. and metre gauge—the former adopted in preference to the English gauge from fear of possible danger from cyclones, and the latter from motives of economy. Whether any substantial gain in economy, carrying capacity, or safety has resulted from the Indian broad gauge is doubtful. The possible greater capacity has not been attained because platforms, station buildings, and running lines have not been laid out at sufficient distances to enable stock of maximum dimensions to be run, and the necessary alterations would now be prohibitively costly. Moreover, to have increased the width of stock would of course have stultified the reason for adopting the gauge, viz. the attainment of greater safety from derailments, and instances have

[1] *Vide* Neville Priestley's *Report on the Administration and Working of Railways in America*, p. 33.

occurred quite recently of the side-way derailment of a 5 ft. 6 in. train by cyclonic wind. At the time of the introduction of the metre gauge there were very cogent reasons for the step. The standard gauge lines were not so successful for some years as they have since become, and owing to the depreciated value of the silver currency and other reasons, money could not easily be raised to extend the railway system on this gauge, especially as the prospects of traffic were uncertain. On the other hand, the administration was convinced of the wisdom of further extension, and the frequent recurrence of famine made this an urgent step. As a result of mature deliberation, a narrower gauge—1 metre—was decided on. It was intended and indeed laid down that the measure should be regarded as a temporary expedient, that the lines should be made as lightly and inexpensively as was consistent with safety, and that the ultimate necessity of conversion to the standard gauge should be steadily kept in view. Most of the metre gauge lines were, as a matter of fact, constructed and worked by companies, and the administrations naturally felt called upon

to improve their lines as traffic grew, which it very quickly and steadily did. But even if Government had had complete and direct control, it is doubtful if the results would have been materially different.

But it seems difficult indeed to find reasons for the decisions arrived at in Australia. It is true that when the matter was under discussion, the existing federal unity of the Australian Commonwealth did not exist. But the whole country was under the British flag, and much of the work was done by British capital and labour. It is therefore all the more distressing that local jealousies were allowed to bring about the present state of affairs—4 ft. $8\frac{1}{2}$ in. gauge in New South Wales, 5 ft. 3 in. in Victoria, and 3 ft. 6 in. in the remaining states.

Africa also exhibits more variety than is necessary or justifiable; South America too, though in this case there is the explanation of different and none too friendly Governments.

For if there is one generalization in regard to gauges which can be safely made, it is that any break of gauge is, *ipso facto*, bad, and that

a very heavy onus of responsibility rests on those who make themselves responsible for such a step. Not only is there the expense of constructing and maintaining transhipment stations, the payment for the labour, and supervision, there are also heavy indirect expenses in the damage, loss, and delay of goods, and their prejudicial effect on traffic, and further losses from the inevitable delays to rolling-stock and the consequent loss of earning power. All these evils make a very strong case against any break of gauge. Lastly, while all these considerations point to the desirability of unification, the expenses, inconveniences, and dislocation to traffic involved in such a measure tend (as in India) to postpone the step in the meantime and to make it even more difficult to take in the long-run.

In discussing the comparative efficiency and economy of broad and narrow gauges there are two very different points of view. The first is that of the theorist or technical expert who is simply asking himself—Which gauge gives the best value for money? Or in other words—Given a certain quantity of

traffic, on which gauge can it be most cheaply hauled? This is the standpoint of A. M. Wellington in his remarks on the subject. Writing as an engineer, and with the natural bias of a conscientious expert in favour of the more solid and durable forms of construction, he is at pains to show that there is no real economy in a narrow gauge. The supposed gain in reduced friction at curves (he points out) is realized when the gauge *only* is reduced, and not the wheel base as well. There is no gain in rolling-stock, weight for weight and power for power. Further, heavy rails are more economical than lighter. We are left, therefore, he argues, with merely some slight saving in earthwork and sleepers.

But this point of view ignores what will probably be the most important factor in the minds of those called upon to decide such a question. Their problem almost invariably is to find the best course to take with the limited amount of money at their disposal. Is it better to wait until they can build on the standard gauge, or to do what they can at once? For it cannot be seriously argued that

in absolute cost there is a very material saving in a narrow gauge,[1] both in cost of construction and in working expenses. Not only is there the smaller section of earthwork, cuttings,

[1] The following figures taken from the *Administration Report on Indian Railways*, 1907, may be of interest:

Standard Gauge, 5 ft. 6 in.

Name of Railway.	Capital Outlay per Mile open. Lacs of Rupees.	Working Expenses per Train-Mile. Rupees.
East Indian	2·3	1·76
North-Western	1·95	2·58
Oudh and Rohilkund . . .	1·22	2·33
Great Indian Peninsula . .	1·79	2·13
Bengal Nagpur	1·52	2·1
Bombay, Baroda, and Central India	1·95	2·58
Eastern Bengal	2·21	2·73
Mean	1·85	2·29

Narrow Gauge, Metre.

Name of Railway.	Capital Outlay per Mile open. Lacs of Rupees.	Working Expenses per Train-Mile. Rupees.
Bengal and North-Western .	·77	1·25
Rohilkund and Kumaon .	·57	1·35
Rajputana-Malwa . .	·75	1·71
South Indian . . .	·80	1·48
Southern Mahratta . .	·79	1·77
Assam, Bengal . . .	1·60	2·34
Burma	1·02	2·03
Mean . . .	·9	1·70

tunnels, bridges, lighter rails, and so forth; there is the implied understanding that the ideal aimed at will be lower throughout—severer curves, steeper grades, a lighter class of work will be accepted. Similarly, rolling-stock costs less, train for train and vehicle for vehicle. All this is necessarily reflected in a lower cost per train-mile. This greater cheapness, it is to be understood, is quite apart from relative economy—that is to say, as incurred by the same amount of work done by the two kinds of line. But the difference in cost and working—as absolute figures—may make all the difference between a railway and no railway, and in any case is a matter of prime importance. It is natural, therefore, that those whose means are extremely limited should find in a narrower gauge the first and most obvious measure of economy, and one for which—if the line is and will be isolated from other rail connections—there is very much to be said.

CHAPTER V

ALIGNMENT

The importance of alignment in any railway project is well brought out in the words of D. H. Ainsworth: "The location of a railroad is giving it its constitution. It may be sick, almost unto death, with accidents of construction and management, but with a good constitution it will ultimately recover." For not only does the conquest of physical difficulties, the natural obstacles of rivers, swamps, hill and valley, depend on the alignment chosen, but at every point the engineer has to bear in mind problems quite outside his profession as an engineer but vitally important to the railway—the obtaining of the maximum traffic and the future working of it under the best conditions. It would be as fatuous for us to neglect this class of consideration as it would be for the engineer.

For the object of the mighty machine under construction must, from every point of view, govern its nature and working. In this respect the question of alignment differs in degree from those of curvature and gradient.

The work of a railway is to serve the commerce of a district, and the conditions of railway working are such that the best method in practice is the fixing of certain recognized stations or depôts[1] at which commodities may be offered for transit on the one hand, and delivery taken at the end of their journey on the other. The number and position of these stations is therefore a matter of prime importance to the railway and to the trading public. To the former, because each additional station, so soon as it pays its own working expenses—interest on cost of construction, station staff wages, lighting, etc.—is a real source of profit. Relations are established with a number of other places, and potential relations with every other station in the country and perhaps

[1] This expression must be held to include all private sidings and wharves, which, being characteristic of large businesses, are most important centres of traffic. As a matter of fact, the points at which private sidings join the ordinary public lines are usually within station limits.

beyond. Doubtless, much of the traffic secured at a new station had in the past gone to neighbouring stations, but it is a rare thing in a district of any promise for this to be the whole result, and once some headway is made, every advance brings others in its train. Further, as new stations are opened, the intervening distances become less, and, *caeteris paribus*, trade will increase in inverse proportion with the lessening of distances and diminution in cost of transport. Their location in relation to the centres of populations and industry is also most important, since the prohibitive cost of road carriage for long distances tends quickly to check the influx of traffic, while a line which pushes its feeders, working branches, and private sidings into every factory and mine in a busy district holds a position unrivalled by any other form of transport. And if there are competing lines, the necessity of a first-class strategical position is even more marked: out of two lines in a district, the line which is on the whole 50 per cent nearer the centre of things will not get merely three-fifths of the whole, but practically all.

From the public point of view the position is essentially the same. A place which is near a line of railway, but not on it, or on it but without a station, will only be able to avail itself of the line for traffic which is bound to go by rail. For some auxiliary means of conveyance to and from the station will be necessary, and will be utilized exclusively so far as possible. All pleasure traffic, all short distances and "smalls" traffic will thus be lost, and there will be a general disinclination to make the most of rail facilities. Taking a longer point of view, the growth and development of such a place will naturally be impeded.

But while there is thus a general unity of interest between a district and the railway which is to serve it, there is not a complete unity of interests between each place and the district, or between each place and the railway. For any particular place which is given the facilities of a station desires its service of trains to be as frequent and fast as possible, and this desire clashes with the desire of other places for a good train service. This is an important matter as regards

passenger service. It is also of considerable importance as regards goods traffic for the really large centres of population and industry. The multiplication of stations, the putting on of working goods trains, with their frequent stops and delays, detract from the efficiency of the through service. Similarly, any deviation from the straight to serve numerous small places increases the length of the journey and the time taken on it. Much can be done, and is done, in such a case by the classification of trains into express and stopping passenger trains, through and working goods trains, and by the working of the two kinds of trains on separate lines. But, generally speaking, the growth of wayside traffic must act prejudicially on through service. Thus it is necessary to hold the scales between conflicting interests and to bear in mind the respective importance of different towns and villages. In practice it is not usually the large centres which suffer, for these can best make their voices heard by "Chambers of Commerce" and by private representations of important traders. Moreover, as we shall see, the far greater economy

of working traffic which is tendered in large lots and for longer distances unites their interests with those of the railway administration.

The carrying of a line to all traffic centres which can be reached with any reasonable expenditure of money and trouble and to the best possible points is thus a primary object, the importance of which can hardly be overestimated. It is emphasized by another consideration of some importance. This is the fact that alignment determines distance, and distance is a great factor in determining rates and fares. Although two principles of levying charges on railways were early recognized —(1) that of a toll or tax for the use of the road, increasing with the distance traversed; (2) that of a charge for haulage and carriage based on the idea of the cost of such service—the former principle is still chiefly followed in the case of passenger fares, and in the case of ordinary consignments of ordinary commodities, although the latter are classified, and charges are made on a scale corresponding to the classification. Hence for a considerable portion of its traffic, the greater the distance

between two stations, the greater the charge realized by the railway; and if we assume that the cost of working the traffic for each unit of distance is more than covered by the charge made, it would appear to follow that it is actually profitable to increase the distance deliberately. This is a possibility which should be borne in mind in choosing an alignment, as it will tend to prevent undue expenditure on reducing distances. But the argument is a dangerous one and needs many limitations. For clearly it applies only to the non-competitive zone. Any avoidable increase in distance has not only its intrinsic disadvantages of some increase in working charges, and a generally prejudicial effect on traffic, but places the railway *pro tanto* on less advantageous terms than other means of transport. When there is competition the argument, as Wellington admits (*Railroad Location*, § 206), is of small account, for then distance is of no effect in the fixing of rates. And when we remember the enormous preponderance[1] of competitive traffic carried at

[1] "Probably about 70 per cent of the traffic between stations in the north of England is conveyed at 'exceptional rates' much

commodity rates, it is clear that the importance of this consideration is dialectical rather than practical.

The foregoing considerations on the one hand, and the configuration of the country on the other, determine the limits of the problem of alignment. When natural difficulties of importance do not exist, there is no problem beyond that offered by considerations of traffic. When they do exist, the problem is a practical one, and ruling principles cannot well be applied. Moreover, it is clear that the considerations of deviations from the straight merges into that of the alternative —curvature—which we will now proceed to discuss.

below the statutory authority" (Marriott, *The Fixing of Rates and Fares*). The percentage in the United States is probably even greater. But these estimates are highly conjectural. See also Acworth, *Elements of Railway Economics*, p. 126: "'Our mileage rates, speaking broadly, only touch the retail business of the country. The wholesale traffic, the large consignments, the constant interchange between great centres, the export, import, and transit trade—all this is done at what are called 'special' or 'exceptional' rates."

CHAPTER VI

CURVATURE

The influence of curvature in railway economics is chiefly on the cost of construction and working, but is not without effect on the demand for transport. The extra cost of construction involved by curvature is not in itself great, being limited to the increase in the length of the section, coupled with the extra care and work involved in laying down a curve and obtaining the requisite elevation. But since curves which are adopted on engineering grounds are adopted, not by choice, but as a means of avoiding greater expenditure on works such as tunnels, cuttings, or bridges, there is always a balance in their favour from this point of view. Such economy is of course off-set by certain increased working charges, which should be carefully estimated.

There is perceptible increase in wear and tear on rails, and this increased effect is most noticeable, of course, on rails of light section or soft character. There is also greater wear and tear on the tyres, axles, and axle-boxes of rolling-stock, and greater expenditure in fuel. This increase in friction may in extreme cases necessitate the utilization of a more powerful engine, or the shortening and lightening of trains. If it really necessitates the running of more trains it is a serious matter. But this rarely occurs. The more probable effect is the necessity for slackening speed, which lowers the speed average and so reduces the capacity of the line.

We next come to the effect of curvature on traffic on the demand side. This is chiefly manifested in regard to passenger traffic, for the running of passenger trains at high speeds round severe curves has unpleasant effects on the nerves and comfort of passengers—an effect which unfortunately is occasionally punctuated by the occurrence of severe accidents. On the other hand, if the speed is slackened, the service is prejudiced, especially in competition with other lines. But there is

some set-off to the detrimental effect, for one of the chief causes of curvature is the presence of striking natural features which give the district a picturesque appearance and tend to attract traffic.

In regard to goods traffic the psychological type of effect is of course absent, and the presence or absence of curvature has no appreciable effect save through differences in charges levied or when marked delay occurs as compared with other routes. Moreover, the position of railways in relation to other kinds of competition is apt to be increased by the presence of natural difficulties, which tend to lessen the force of competition by canal and road.

On the whole, then, the disadvantages of curves are not of first-class importance, and are insufficient to prevent their adoption when this will result in the avoidance of heavy expenditure on a straighter line.

CHAPTER VII

GRADIENTS

GRADES similarly have some effect on both sides, but their influence on the "demand" side is even less than in the case of curvature, while the effect on working costs is considerably greater. For there is some probability of the necessity for severe gradients indicating the presence of striking natural features which may tend to induce pleasure passenger[1] traffic, and as to goods traffic, may place railways in a better position to compete with other forms of transport. But the adverse influence of gradients is far more marked than the favourable side.

[1] Compare the list of great inclines reproduced (Table 190, page 699) by Wellington from the *Engineer* and added to by him. Several of these are in Switzerland, where tourist traffic is perhaps of paramount importance, and two in Ceylon, where it is of considerable dimensions. On the other hand, many of the busiest industrial centres, the locality of which has been settled by the presence of mineral deposits, are in hilly country. But in this case the loss of "pleasure" passenger traffic is more than made up by that undertaken on business considerations and by goods traffic.

First, there is the direct extra cost on working of rise and fall. The amount of this is of course dependent on the severity of the grade. In the case of slight undulations, it is not necessary to make any alteration at all in the class of engine used or in the working of the ordinary engine, and *a fortiori* no change in the length, weight, or composition of the train is called for. There will be some diminution of speed in ascension, but soon this will be counterbalanced by the increased momentum, causing higher speed in descending. No appreciable effect on rolling-stock or road-bed occurs.

The next class of cases are those where the added momentum downwards must be artificially checked. This is done, first by the shutting off of steam, and when that is insufficient, by the use of brakes as well. In the former class there is a loss of time, for the lower speed in ascending cannot without risk be set off by a corresponding gain in descending. In the latter there is loss of speed in both directions, and there is waste of power and added wear and tear on rolling-stock and road-bed through the use of brakes.

The limit of the next class is reached when it is necessary to modify the engine power. This is due, firstly, to the use of a specially powerful engine ; secondly, by the attachment of an additional engine or engines at the foot of the grade. These measures involve further expenditure, increased in the first case by the higher cost of the special engine, and by the extent to which this engine is wasting its power over the flatter parts of the section, and in the second case by these causes, with the added fact that an assistant engine must necessarily spend a great part of its time in waiting with steam up, and is therefore an expensive and uneconomical weapon.

In those of the foregoing cases where it is necessary to halt at either end of the section to pin down and release brakes, to change train engine, attach and detach assistant engines, there is loss of time and consequently a detraction from the earning power of the stock and of that section of the line.

Lastly, there are the most important cases of all, where the train must be altered and its length and weight curtailed over the gradient. This necessity means the full direct extra cost

of the additional train or trains necessary, alleviated only by the very slight saving in running back some engines "light," and further the more serious leakage from delay to stock, cost of extra staff, and other expenditure at either end of the section.

Thus it will be seen that the settlement of questions of grade has a most important effect on the working efficiency of the line. Hence, while the engineer's problem is always to obtain the best settlement possible with the money at his disposal, in regard to gradients he is open to pressure from those who will have the making up and running of trains—the traffic and locomotive departments—to give them the best possible conditions. There is thus antagonism between the attainment of economy in construction and in working, and the decision arrived at will therefore be affected by the margin of available money. The traffic difficulties are often only fully realized after experience of actual working, and it is fortunate that it is possible to improve gradients after the opening of the line without great expense or inconvenience.

CHAPTER VIII

OPERATION: ANALYSIS OF

THE gauge of a line and the dimensions of the carriages and wagons give what may be called the physical capacity of the line as determined by the operations of construction and equipment. But the dimensions are of no interest or significance in themselves but only when the wagons fulfil their destiny by being moved from one place to another. The wagon-load is therefore a most important unit. And since wagons must be hauled by locomotives in trains, the number of wagons in a train is also of great importance, for this number, multiplied by the average capacity, gives the capacity of the train. Railway rolling-stock, however, is not exhausted by one journey, but is used for many journeys in either direction. The nature of the return

journey is therefore a matter of interest. And the rapidity of the journeys in both directions, or the number made in a given time, which when also used as another multiplier gives the real working capacity of the line, is a further matter of primary importance. For if you take the gauge and size of stock for granted, the real working capacity of the line varies in direct ratio as the average speed with which the stock is moved in different directions increases. Moreover, it must be remembered that both gauge and dimensions of rolling-stock have a direct effect on speed, though in the case of gauge it may be attributable to the general characteristics of the different gauges rather than to the distances between rails *per se*.

Thus real working capacity depends on many factors, and alteration in any one involves alteration in one or more of the remainder. The chief of these factors are:

Gauge.

Dimensions of stock.

Average speed.

Amount of power utilized.

It will be found in more detailed analysis

that the reciprocal action of these variables must never be lost sight of.

So far our analysis has dealt only with the mechanical factors determining the condition of the supply of transport, but we have assumed throughout that our industry of transport is carried on for a profit, and this ultimate object of the work—the obtaining of the greatest possible aggregate remuneration—must also be considered. For there is no sense or object in moving empty vehicles, they must be filled as well as possible with paying freight.

Thus there arises another set of considerations—the desire to so fill and move the vehicles as to make them reach the maximum of earning power. But, on the other hand, traffic cannot be obtained to order, it must be taken "as it offers."

There are from the interplay of these variable factors certain inherent antagonisms in railway working. One arises entirely within the sphere of action of the "operating" traffic officer, *i.e.* the man concerned only with the movement and conduct of traffic—the supply side (as distinct from the staff whose

duty is to retail it to the public, commonly called the "commercial" side). For we saw that the working capacity of the line depends on the actual carrying capacity and the average speed, and these are mutually antagonistic. Increases in the size of wagons and the length of trains tend to bring, as we shall see in more detail later, a lower average speed and *vice versa.* Thus the working capacity which is increased in one direction is curtailed in another. This antagonism can only be avoided by varying the motive power supplied, but the possibilities in this direction have practical limits. Another antagonism arises between the respective ideals of the "operating" and "commercial" official. The former seeks to attain economy of haulage by well-filled wagons and lengthy trains, since these tend to reduce the average cost per ton hauled. On the other hand, since traffic often arrives piecemeal, these ideals can only be attained by keeping some wagons waiting for others to complete the train-load, or some goods waiting for others to complete a wagon-load. But waiting curtails the facilities offered to the public and tends to drive away traffic.

These conflicting tendencies must find their unification in the work of the general manager, whose real work begins where that of his superintendent of transportation and commercial manager ceases. It is for the former of these two to evolve the best and cheapest methods of moving the traffic, and for the latter to market the capacity of the line to the best and fullest advantage, each performing his duties with constant reference to the duties of his colleague. But it is for the general manager not only to supervise and unify the more important issues of their work, so far as his training and experience fit him to do so, but to regard the capacity and revenue-earning power of the line with reference to its further characteristic as an industrial undertaking promoted and carried on with a view to profit. The extent of the general manager's problem is indicated by the amount of the line's obligations, that is to say, by the amount of the debenture interest and of the preference and ordinary dividends. These represent an annual sum which must be discharged if the line is to be accounted prosperous. And it is his peculiar duty to carry the prosperity of

the line to the highest point. As we shall see later, there are peculiar circumstances in railway working which define on the one hand the extent to which this prosperity can be carried—having regard to the interests of the public and the rights of State intervention through which these interests assert themselves—and on the other hand the degree to which the usual palliatives of adversity may be applied. But there is abundance of room between the condition of the best and the worst managed lines to admit of the manager justifying his existence and selection.

CHAPTER IX

OPERATION (*contd.*): SIZE OF TRAINS AND WAGONS

As might be expected, circumstances have a large effect in deciding the ideal wagon and its load, and the ideal train-load for any given time and for any class of traffic on that line. There are undoubtedly cases where it is sound practice to increase the dimensions of stock and the size and weight of trains to the largest practicable limit.

In the case of goods traffic such cases arise when traffic is offered in large and regular quantities and for a lead of considerable length; when the commodity is one which will not bear any but the lowest rates, this practice becomes not merely sound but absolutely necessary. Coal and iron ore, for instance, are commodities the value of which

is low as compared with their bulk and weight. They cannot be burdened with high transportation charges, or the traffic in them will disappear through its capture by the sea, or by inland water competition, or by such a rearrangement of the industries most needing them as would obviate their travelling except for short distances. The traffic, moreover, is large and regular and is handled with every possible economy at either end. Once the stream is started, the actual time taken on any one journey is of comparative indifference. All these considerations point to the necessity of moving such traffic at the lowest possible expenditure. And it is established[1] that long and heavy trains made up of large capacity wagons do help materially to achieve this end. For longer trains mean fewer trains, and thus a saving in engine expenditure

[1] Cp. Neville Priestley's *Report on Railways in America*, p. 57: "All that has made the low rates now charged for goods in America profitable is the low cost of operation per ton per mile, and the low cost has chiefly been secured by increasing the carrying capacity of wagons and the hauling power of engines."

See also M'Dermott, *Railways*, p. 86 *et seq.*: "The Lancashire and Yorkshire Railway hauled an increase in tonnage of 720,000 tons in fewer trains. The Great Northern decreased their goods engine miles by 2,117,000 miles and train miles by 1,341,659, with an increase in earnings of £206,560."

and in train staff wages. The larger and fewer wagons mean less frictional and air resistance per ton moved, and thus a lower "draw-bar pull." There is also some saving in general expenditure, in stabling room for empty wagons, in station and yard staff, and in invoicing and accountancy work. As against these advantages there are of course considerable disadvantages. The colossal type of engine, limited by its gauge, has serious mechanical and technical defects which detract from its efficiency. The larger and heavier trains mean heavier rails and stronger bridges, more wear and tear on the road-bed, greater expenditure on repairs and renewals of wagons, longer sidings and platform wharves, and higher wages for driver and fireman. More important still, there is slower movement all round, a longer time in getting away from a station and in stabling a train at a station, and lower speed on the journeys, fewer journeys of these wagons themselves and of other branches of traffic, and thus some decrease in the general capacity of the line and in the facilities offered to other kinds of traffic. But roundly speaking, this is the cheapest way

of dealing with such traffic, and since cheapness is the main consideration, it is the best way.

Or take the case of wheat and other foodstuffs for export, say in America, India, or the Argentine. The value of these is much greater than that of iron ore and coal, and intrinsically they can bear a higher expenditure, but there are peculiarities in this traffic. Many countries compete for the wheat markets of the world, and the characteristic property of wheat, which flourishes best on the soil just taken into cultivation, is ever increasing the area of supplies. The price is thus fixed in the great European centres of the traffic, Liverpool and Antwerp, by the price of the most favourably placed competitors. A competing country must work to that price, but the farmer must make a living wage, or being a man of comparatively small capital he will go out of the business. The railway carrier must therefore take almost what he can get, and in any case cannot—in view of the long distances for which wheat now travels—expect to get a good rate. Economical transit is therefore essential, and the economy of the

larger train-load is indicated as necessary to the perpetuation of the traffic.

Other cases are the traffic in fruit from Mexico, the southern states of the United States, and the West Indies to the great cities of Chicago and New York, and in fruit and vegetables from Italy to Boulogne, Roumania to Hamburg, and Galicia to Bremen, *en route* to the markets of Great Britain.[1] The intrinsic value of such commodities is low, and the price at the market, with all freight charges added, must still be low or the sales will contract to insignificant dimensions. Economy in working expenses per ton must therefore be attained, and long heavy trains go far towards this end.

But it will be found that *all* the conditions enumerated are necessary to make out an incontrovertible case for this practice, and that the absence of any one of them effects a material change in the situation. Thus in England there is a large export trade in coal, the value of the coal exported coming fourth in the list of our exports. But it is not consigned in very large wagons or in very large train-loads. The N.E.R. consider a 20-ton

[1] E. A. Pratt, *Railways and their Rates*, pp. 314-15.

wagon on four wheels on the whole most suitable, and a train will not ordinarily consist of more than, say, 800 to 1000 tons gross load. In India it will reach 1200 tons, and in America perhaps double that. The explanation is to be found in the much shorter distances, making the speed of the trains an important matter. For in Northumberland and Durham on the N.E.R. and in South Wales the distances from pit to port are so short that the "rakes" of wagons must make two journeys in the twenty-four hours to do efficient service. And there is further heavy traffic of other kinds which must not be seriously impaired by slowly-moving coal trains.

Much of the import traffic, such as wheat sent by sea to Liverpool, Hull, and Cardiff, or cotton to Manchester, is despatched at once to local mills and does not receive onward transit by rail in bulk, but as manufactures sent in comparatively small lots. Other traffic, such as the fruit and vegetable traffic from Plymouth and Southampton, is certainly sent to London, but this is of a very perishable nature and has already spent a considerable time on the sea. Moreover, it must travel over sections with a

large high-class passenger and other traffic. It must therefore be sent in light and fast trains, and so does not meet all our essential conditions.

But the one feature which goes farthest to explain the absence in England of large wagon and train loads is the very small size of the vast bulk of the consignments offered. In the early days of railways the inevitable result of encouraging retail traffic was not realized, and in fact railways competed so successfully for this traffic that they now almost monopolize the traffic in larger parcels, leaving very little for the Postal Department or for carrying companies.

The shopkeeper has been quick to take advantage of this excellent service, which has often enabled him to dispense with the middleman, and, in any case, to avoid keeping stock himself. As Mr. Pratt has pointed out in his excellent chapters on the subject: "When any particular stock is running low he can post an order, send a telegram, or speak over the telephone to the wholesale house [Mr. Pratt might have added, often to the maker direct], and he will generally expect to receive the

desired consignments by train or otherwise on the same or the following day." Thus has grown up an enormous business in "smalls," the essential features of which are small average size, together with rapid transit. As typical of this Mr. Pratt quotes figures of goods offered at the Camden and Broad Street (London) depôts of the L. & N.W. Railway, which show that the percentage of consignments of less than 5 cwt. was 91 per cent at the former, 90 at the latter. At Birmingham the average weight was just over 5 cwt., at Manchester just under 5 cwt. Such traffic in the aggregate is important. It means enormous benefits to the retailer and the consumer, but it is poor business for the railway, for the railway is not at liberty to keep these small consignments waiting until a good load is made up for each place. Small as they are, the sender and receiver expect the same prompt transit as the larger customer. Undoubtedly in many countries used to large consignments such traffic would not be accepted, but the sender would be referred to the Parcel Express Companies, who in the United States and in Germany make a trade

only from 100–2000%

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of working up consignments, realizing a fair profit by the difference between the rate charged them by the railway and that which they charge the public.

It is clear that for such traffic it is useless to discuss long and heavy trains, or indeed large wagons. The former are impracticable, for "smalls" traffic is collected and despatched at every station on the section, and in itself is attended with so much delay and detail work that the working trains must be kept light and small or they would never get through. There is a better case for large wagons, but they have the disadvantage of giving a larger working unit, which inevitably means greater wastage of room and greater delay in serving a traffic of essentially retail character.

Nevertheless, it cannot be denied that British railways have been slow—too slow—to change in this matter. Natural inertia has doubtless been strengthened by dread of the heavy expenditure in altering sidings, goods sheds, weigh-bridges, turn-tables, coal-tips, and screens, and the dislocation to traffic which the systematic adoption of heavier trains and wagon-loads necessarily involves.

There is also, in England, the unfortunate legacy of privately-owned wagons, and the railways have no legal power to put an end to the practice. In the coal trade especially—the one class of traffic where a good case for large capacity wagons certainly exists—the private wagon is very numerous, and changes mean not only the replacement of the wagons but alterations in sidings, loading appliances, and warehouses. Nevertheless, it should be practicable to work gradually in the direction of more economical vehicles, and the modification (in 1902 only) of the old Railway Clearing House specification for private wagons which prohibited a carrying capacity exceeding 10 tons, is perhaps a hopeful though a belated sign! At least it is to be hoped that improvement in the ratios of tare to paying load, which in England were until quite lately no better than 1-1 or 1-1½ as against 1-2½, the accepted standard in many countries, will not be long delayed. For it cannot be seriously denied that the attitude of some English railways on the subject has been ultra-conservative to that point where conservatism is altogether indefensible.

CHAPTER X

OPERATION (*contd.*): INEQUALITIES IN GOODS TRAFFIC

It is obvious that if a line is to reach its maximum carrying capacity it must be able to attain good loads in both directions, and that any percentage of deficiency in loads in one direction means half that percentage of loss in total loading. It is curiously enough characteristic of the best train-loads obtained that they are of such a nature and obtained under such conditions that the return loads are almost invariably poor — indeed, often practically nil. For consignments despatched in complete train-loads usually consist of great staples, such as grain or other food products, and the cheaper minerals, especially coal and iron ore. Of these by far the greater proportion are intended for export to other countries, and the remainder usually for some very

large market, such as London, New York, or Chicago, where they are either consumed or split up into smaller quantities for onward transit and distribution. In the former case the corresponding imports are of a different character, perhaps less bulky and more valuable, and often of markedly smaller value. In the latter case there is no similar "bulk" traffic, because the large centres are by no means the centres of manufacture itself, but rather of wholesale dealing, and to the extent that they are manufacturing places they must find their markets on a wider scale, and in different places, and therefore despatch in smaller consignments. Moreover, the open trucks or hoppers which are suitable for coal or ore are not suitable for more delicate traffic. In practice, therefore, it is often found best to make up "rakes" of wagons for regular train-load traffic, and to utilize them solely for that traffic, endeavouring to make up for the loss of loading in one direction by the quicker handling and prompter return to the place of loading, which this reservation makes possible. This is particularly so when the load is a short one, even as judged by English

standards. Thus the double journey per day which coal trains make from collieries to port over short runs in the North of England and in South Wales would be altogether impracticable if it were attempted to find back-loads for these wagons, even were it possible to find loads of commodities which could suitably be despatched in such trucks. In such cases all that can be done is to work back the empty wagons in longer trains, say with 50 per cent more trucks, and thereby reduce the number of loaded engines necessary. But even this device, which enables the management to run back some of the engines "light," is a doubtful economy. The trains are longer, need careful handling, are liable to break in the middle, take longer to stable in passing sidings and to get away again, and involve the lengthening of passing sidings. On the other hand, an engine running light costs one-third as much as the same engine loaded. The resultant saving is therefore not large.

But when distances are long the wastage of empty running is too enormous, and efforts are made to obtain traffic from the opposite direction. Thus in India coal intended for

up-country with a run of 800 or 1500 miles is sent as far as possible in covered wagons because any downward traffic which offers will need such accommodation. But, of course, the demand for coal, with the high price which carriage over such long distances involves, is a much smaller affair, and there is no question of train-loads as in the case of export coal.

In the case of ordinary miscellaneous traffic there are not the same factors tending to produce great inequality of traffic, but it usually happens that there is a preponderance in one direction, even though such traffic can be loaded in both directions on the same wagons. There is no device of management by which it is possible to abolish the net empty running. Taking the amount of traffic in the two directions as constant, this remains an unavoidable debit to efficiency and economy. Therefore it is clear that the best course for the management is to seek a remedy by improving the amount of traffic in the lighter direction, either by offering specially advantageous rates or special facilities for traffic moving against the main flow.

Thus, in the United States (Priestley, p. 48), "there are usually two sets of rates, one for traffic moving in the direction in which the bulk of the traffic moves, and another for traffic moving in the opposite direction, that is, the direction in which empties move."

This practice is justified even if the special rates do not so much as cover train expenses, for even then they make some contribution towards expenditure which must in any case be incurred. If, then, the return from them is sufficient to cover the extra work of handling, the very slight extra cost of haulage, and the slight slackening in quickness of movement, it is sufficient and valuable. As showing to what extent successful results have been obtained from this practice in America, no definite information is available, but there is one instance in which a similar policy reaped extraordinary success, although applied under most disadvantageous conditions. This was in Holland. We have seen that the Dutch railways were for some time anything but prosperous. In 1857 an Englishman (the late Mr. James Staats Forbes) was called in and found certain possibilities of traffic in the

demand for coal in Holland on the one hand, which he saw might be supplied from the coal-fields of Westphalia, and in the demand of the Westphalian ironworks for ore imported from Spain on the other. In the words of Mr. Pratt (*Railways and their Rates*, p. 295): "As goods manager of the line, Mr. Bingham went most carefully into the problem, and found that a rate of one cent ($\frac{1}{5}$ of 1d.) per ton per kilometre would suffice to cover all charges of transport, provided that the Railway Company were supplied with 200 tons of coal per train in twenty wagons each loaded with 10 tons. This represented the freight in the one direction —from Westphalia to Holland. In the opposite direction the coal wagons could be filled up, say at Rotterdam, with iron ore from Spain for the ironworks in Westphalia, and it was found that in the circumstances the Company could afford to carry the back-loading of ore at a charge which worked out at 1s. 3d. per ton for the entire journey of 150 miles."

CHAPTER XI

OPERATION (*contd.*): FLUCTUATIONS IN GOODS TRAFFIC

ANOTHER series of problems are those attributable to the fluctuation of traffic according to seasons and trade movements. Here also it is traffic in the staples, grain and minerals—in many respects by far the most satisfactory of all—which gives most trouble, and of these, of course, the former is by far the most important in this connection. Complete remedies are not easy to find. It is easy for the trader to lay down as a first principle that every railway should provide, not for its average, but for its maximum traffic, and that any policy which falls short of this ideal is clearly wrong from every point of view, harmful to the trade, to the State, and to the railway itself. The very men who in times of brisk traffic, when supplies of wagons are

short of demands, urge through Chambers of Commerce and newspapers the rapid construction of large supplies of additional wagons, would themselves be the last to make important and costly extensions of their works for an increased demand which may last only for a few weeks. It is not that there is any mechanical difficulty in the adoption of such a policy. A railway could indeed estimate its highest traffic at any one point of a prosperous year, and provided no financial difficulties arose could equip itself with rolling-stock accordingly. But since, *ex hypothesi*, a portion of this rolling-stock would be idle during the greater part of the year, and perhaps the whole of other years, the cost of its low earning power, and of the extra lines for stabling it during its idleness, would in the long-run be borne by the traffic as a whole, and the community would pay for it. Moreover, wagon capacity is not the whole, perhaps not the chief factor in the capacity of a line. If more wagons are to be put upon the line, more engines are needed, more running lines, more staff, and better terminal facilities. In the case of

export traffic, the chain of communication will need also an increased tonnage of ships at the country's ports. In a prosperous and advancing country the provision of all these additional facilities may be safely undertaken, but the development must be gradual and coherent, or it is worse than useless, and will result merely in confusion, delay, and wasted money.

Looking at the matter impartially, it would seem clear that much can be done by the producer and middleman towards the avoidance of such fluctuation in the demands for transport. Fluctuations in general trade and credit cannot be controlled by the individual, and it seems inevitable that the production and commerce of the world should proceed in alternate waves of expansion and contraction. But in regard to minerals there are no insuperable obstacles in most countries to regular raisings, and with the increased use of machinery and the specialization of labour in mining work such difficulties as exist should tend to diminish. In regard to grain, the use of elevators and warehouses tends to steady shipments, but these must be erected

near the place of origin if they are to have any great effect on internal transport. The railways, on the other hand, can contribute to the desired results by quoting specially low rates in the off-seasons, and thus providing an inducement to more regular shipments. And so far as this policy is successful it not only tends to economy in transport but has the additional advantage of steadying values, of reducing speculation, and producing a firmer average price for the consumer.

CHAPTER XII

OPERATION (*contd.*): CLASSIFICATION OF GOODS TRAFFIC

THE goods traffic of a railway consists of streams of traffic of greater or less extent and comprising an almost indefinite number of articles between any two of a large number of stations. Most railways happily possess some streams of traffic of a uniform character covering the regular movements of some great staple from the region of production to a port or large market, and for such traffic the problem with which we are now concerned only exists in a small degree. But every line caters also for miscellaneous traffic, for small consignments of highly diverse character travelling between any two places on its line. Such traffic presents a series of very difficult problems. Each consignment must be separately dealt with at the receiving station, receipted and

invoiced, weighed and booked; it must be duly loaded and perhaps transhipped *en route*; it must be taken out at its destination station, tallied, delivered, and accounted for. The class of work involved is detailed and intricate, and therefore slow. It is a kind of work eminently unsuitable for a large company measuring its capital by millions, its daily expenditure by tens of thousands, and serving a populous and busy country needing rapid, cheap, and convenient transit facilities. It is therefore not surprising that in many countries the railway rids itself of as much of such work as it can. Recognizing that the problems it must face will be lessened if such traffic is only accepted in respectably-sized consignments, it declines to accept smaller traffic, or penalizes it by charging a higher rate. Thus the "spade-work" is forced into the hands of a middleman or parcels company, who do some of the work of classification, and the accumulation of loads in their premises, recouping themselves by charging a higher rate to their customers. In Germany particularly the "Spediteur," and to a less extent the "groupeur" in France, do a large and important business in the collection and grouping

of consignments and in the building up of 5 and 10 ton loads. In England, unfortunately for the railways but fortunately for the public, the railways have not been able to avail themselves of this aid, and the whole of such work falls on them. Moreover, the limits of weight permitted by parcels post in England throw work on the railways which in other countries is done by the Postal Department. At the same time the work of classification, despatch, and delivery must be done quickly by the railways or not at all, as if delay is allowed to occur it will leave them and go by road. As it is, when distances are short, much already goes by road,[1] and with the advent of, and rapid improvement in, motor vehicles

[1] Cp. E. A. Pratt, *Railways and their Rates*, p. 100. Notice especially the comparison of parcel traffic per head of population to Walthamstow and Edmonton, close to London, with that to Colchester and Chelmsford, farther away.

	Population.	Gross Tonnage p.a.	Per Head of Population..
Walthamstow . . .	95,125	1,000	24 lbs.
Edmonton	46,899	250	12 ,,
Colchester	38,351	13,000	759 ,,
Chelmsford	12,580	9,000	1603 ,,

See also Waghorn, *Carriers and the Railway Companies*, dealing with the fierce struggle of the railways to maintain and extend their hold on this traffic as against Carter Patterson and similar competitors.

this is likely to be more and more the case. The cost of this work of classification is therefore high, and out of all proportion to the cost of transit itself. For in order to do it, and at the same time to avoid delay to the goods, it is necessary to keep large staffs of men for the purpose, and even then to carry poor loads. Yet with all its difficulties the railway cannot well afford to lose it. Their capital expenditure has been exceedingly heavy, and no small part of it has been incurred in providing facilities for this very class of work. Moreover, if they were deliberately to set themselves to lose it, the result might be widespread consequences to their other traffic.

But apart from this particular class of traffic, much of the work of classification is a necessary part of all miscellaneous traffic, and is a natural consequence of one line of transport serving many destinations. Let us take the case of a large station which has collected a fair average train-load of general merchandise for places all on one of its lines.

The desideratum is of course (1) to make up as far as possible one or more wagon-loads for each station at which the train must stop;

(2) to group them together or in the right order; assuming that the work of shunting will be done by the train engine, in order of priority from the engine; (3) where wagon-loads are impossible, to group together consignments for neighbouring stations, so that each wagon may be emptied and cut off in order. This work of classification may be divided in varying proportions between the starting station and intermediate stations or yards, or it may be left to be done as well as possible *en route.* To do the work at the starting station means the construction of the necessary lines, wharves, and warehouses at the city station, often at great expense, and the employment of the necessary staff. It means also some delay before the consignment starts. Classification at an intermediate station means that the work may be done at a more cheaply worked yard, but it is probable that the delay there plus the unavoidable delay at the starting-place will exceed the delay at the latter place when all the work is done there. But the deferring of the work until the train is on its way is worst of all. It means bad loading of wagons, bad marshalling, involving empty or half-loaded

running and much shunting and waiting at stations; general delay to the train itself and to all other trains. Hence the best-managed lines prefer to spend money freely at city stations and classification yards *en route.* Even then delay occurs in such yards, sometimes to a serious extent. Thus an American writer says regarding one of the best-managed American lines (*North American Review*, 1907): "On the main lines of the Pennsylvania and the Baltimore and other railways, on the level plains from Philadelphia to Baltimore, the freight steamer that goes poking through the canal by night ensures quicker delivery than do the railroads, because the boats always go from wharf to wharf overnight, and the freight cars sometimes get delayed in the yards."

But this criticism, as it is certainly loosely expressed, is probably exaggerated and would not be accepted as correct by American railway men. Certainly there is some unavoidable delay due to the immensity of the work of classification in the case of a railroad with a large business. But as the business grows, so do the facilities and the staff. In normal times on a well-managed English line the

accumulation of consignments awaiting despatch is cleared off during the night, so that in the morning there is a clean sheet and a fresh start. And though individual cases arise which warrant complaints, these are almost invariably due to mis-despatch and not to real delay or slowness in working, and may be set down to inevitable deficiencies in the human factor.

CHAPTER XIII

OPERATION (*contd.*): PASSENGER TRAFFIC

Passenger traffic is distinguished from goods by several characteristics some of which lead to mitigate, others to intensify, the problems of operation. The actual weight of the paying load composed of human bodies and their impedimenta is sufficiently low to obviate any discussion as to the most economic method of haulage so far as they are concerned. But all the considerations attached to the facts of frictional and wind resistance remain, and a new one arises—that of providing such rolling-stock and permanent way as provide at least the average standard of speed, safety, and comfort in running demanded in the country in question. For not only are human beings able very effectively to complain of any dereliction in this respect, but their independence of thought and freedom of action make it

necessary for the railway manager to pay the very greatest heed to such complaints on pain either of losing their patronage to other rival routes, where the journeys are necessary, or of diverting the money available to quite other destinations, where the traffic is "pleasure" traffic. Hence careful attention must be given to the relative costs of building, maintaining, and running bogie-stock as against four- or six-wheeled coaches; of the extra cost of providing corridor coaches, lavatory accommodation, dining and sleeping cars, electric light, and—in warm countries—fans, and so forth. And when extra expense is involved—as it is practically under all heads—it must be balanced against the higher earning powers thus attained as compared with those which would result without such amenities. Here, as perhaps nowhere else in railway management, the slipperiness of, or elasticity of demand peculiar to, passenger traffic make it essential that the problems of supply and demand be dealt with together, that the work be concentrated under the guidance of one able to view the matter from both sides.

This greater independence of passenger

traffic has, however, one compensation. The passenger does more for himself; he has no need of being collected or delivered; he classifies and tranships himself and completes his journey with some little aid from the station staff. Thus he calls for no expenditure on works and staff comparable to that involved by collection and delivery carts, warehouses, shunting and transhipment yards. At the same time, his mobility has the disadvantage on competitive routes of weakening the hold of any one line on the traffic; he "routes" himself, and may usually be depended on to select the cheapest and shortest route, which may or may not be that of the line on which he commences his journey.

Passenger traffic is free from the marked difference in extent in different directions which we have seen to be characteristic of goods traffic in the great staples. There is nothing in passenger traffic corresponding to this chronic inequality. The nearest approximation is the case of emigrant traffic from countries with surplus populations to districts needing more labour. But this cannot, from the nature of things, form a large proportion

of the whole, nor can it be permanent. As a general rule, the movements of human beings between different places about balance, and there is no substantial difference in average passenger loads in different directions. There is, however, one class of passenger traffic—and that the densest of all—which is characterized by a somewhat similar disadvantage.

In the case of suburban traffic, which, where it exists, naturally forms the most regular and permanent passenger traffic of a railway company, there is a striking variation in density as between different parts of the day. There are some two or three hours in the morning of workmen's trains, followed by an hour or two of office and shop workers. Then the trains must stand idle until the evening, when first the workmen and then the office and shop staffs are conveyed back to their homes. And to some extent the two distinct classes must be carried in different stock, for what is suitable for the one is not altogether suitable for the other. It is true that the trains are crowded, often overcrowded, since each passenger naturally wishes to travel by the last train which will convey him to his place of

work by starting time. But on the other hand, the fares charged are low, indeed almost unremunerative. Moreover, the empty trains must either be accommodated in sidings at the city, involving the acquisition of costly land, or must be run out again empty to a place where land is cheaper. Such traffic, therefore, possesses inherent disadvantages.

Generally speaking, however, passenger traffic is characterized by greater uniformity and simplicity than goods traffic, and these factors enable it to be worked on a stable and punctual time-table, which in any case would be demanded by the passengers themselves, who would not be prepared to put up with the delay and uncertainty of timing inseparable from goods traffic.

BOOK II

RAILWAY TRANSPORT: DISTRIBUTION AND CONSUMPTION OF

CHAPTER I

GENERAL ANALYSIS

IN our preceding chapters we have been concerned with the construction, equipment, and operation of railways, the handling and haulage of traffic; in other words, with the *production* of the commodity of railway transport. Certainly in the discussion of this subject-matter occasional reference has been found necessary to the *demand* for the commodity, to the conditions under which it is to be distributed and sold. But, on the whole, the problems before us have been of a mechanical rather than of an economic character. To a large extent they have been the problems which confront the mechanical departments of a railway: the engineers, locomotive, and carriage and wagon staff, and where the work of the traffic department has come under notice, it has been that section of

the department which comes into closest touch with the technical departments, whose duty it is by manipulation of the plant of the line to carry the traffic offered to it to the best advantage.

On the other hand, the problems now before us are of an economic rather than a mechanical kind. They concern the distribution and sale of the commodity of transport, work which in the case of this particular commodity must, as we have already seen, be carried out by a part of the railway itself and not by independent middlemen and retailers. They centre round the fact of the exchange of transport for money, and exchange in itself is the central fact of all economics. They bring into conjunction the divergent interests of the seller and the buyer—the desire of the former to obtain the best prices for his commodity, and the desire of the latter to obtain the best value for his money.

Further, they unify the constitution and character of the railway as a whole. For, generally speaking, and in the long-run, railways, in spite of all their peculiar characteristics, are business undertakings. Even

when most under the influence of the State, they are undertaken with some view to their profitable character; when not merely financed or constructed but actually worked by the State, they are so worked as to give reasonable returns on the public money invested in them. It may often be that the only return which is possible is lower than that which would be accepted by private parties, especially during the earlier years of their operation, but ultimately greater prosperity is hoped for; further, it is felt that in the case of State concerns some part of the return can not only be deferred, but can well be accepted in the shape of the greater general national prosperity which they bring with them. Where these considerations are insufficient to explain the fact of national railways which continue to be maintained and worked with poor returns, there is the consciousness that the money invested in them is irretrievably sunk, and that the low earnings obtained from them are at least very much better than no earnings at all. In the case of State railways which are distinctly prosperous, it is by no means usual to forgo handsome revenues in order to lower

rates. Indeed, the complaint of traders as against State railways is more often that too much stress is laid on their revenue-earning capacity and too little on their general usefulness, as witness the case of Germany, where it is urged that railways "are made not only to cover working expenses, maintenance of road, and interest on construction and sinking fund, but also to meet the very large expense incurred in carrying gratis or almost gratis for the State mails, parcels, military stores, etc., and finally to pay over to the Exchequer a large surplus" (E. A. Pratt).

Now it is this main economic motive of "making them pay," present practically in all cases, which forms the unifying bond between that part of the organization engaged in producing and that engaged in distributing the commodity of railway transport. The nature of the concession given to a scheme of railway promotion, the character of the line and its equipment, the amount and kind of traffic accepted and the conditions under which it is accepted, must all be fixed with an eye to the amounts which can be marketed at the different prices obtainable.

Lastly, the railway as thus unified has relations not merely with its immediate consumer, the trader consigning goods by it, but through him with the ultimate consumer—who must in the long-run meet the charges for transportation out of the retail price paid by him—and indeed of the nation at large so far as it is dependent on railways for internal transport.

We thus assume the general operation of the economic motive in railway business, the desire to carry it on at a profit. But in the case of railways we are not justified in making the further assumption—latent in all strictly economic discussions, and of great though by no means obvious importance—not merely that such motives alone are operating, but that every one and everything is perfectly free, able, and willing to follow their lead, that, in short, there is perfect economic freedom or lack of friction. This is emphatically not the case with railways, and a full recognition of this fact at the outset will go far to explain many phenomena which on economic grounds are difficult of explanation. There are, for instance, the cases of some railway lines which

from the absence of all effective competition really have a monopoly of the carrying trade of their district. Yet they do not exact by any means the maxima charges which the traffic might easily bear, even after making full allowance for the decreased consumption which higher charges necessarily entail with the strictest monopolies ; in other words, they do not reap the full economic benefit of their position—their full "monopoly rent." This is because they are not allowed full economic freedom : the authority which has conferred upon them this monopoly has very properly reserved the right to limit and regulate its exploitation in the interests of the public which it represents, and to this end preserves throughout the country due reasonableness, proportion, and solidarity in railway rates generally.

The same influence is felt in the contrary direction in those cases where a railway finds itself unable to earn an adequate gross revenue. On ordinary economic assumptions the appropriate remedy would be the raising of prices. This measure would, it is true, diminish the aggregate consumption, but the smaller

business available would, *pari passu*, result in the extinction of the least favoured competitors. Such a course of action again is prevented by the same Governmental regulation. In England, for example, where State influence is by no means unduly preponderant, not only are maxima rates fixed which can in no case be exceeded without express sanction, but railways must give fourteen days' notice of any proposed increase, although within the maxima, and are even then liable to have to resist an appeal against it. Further, in extreme cases, when the ultimate prosperity of a line is found to be absolutely hopeless, when it cannot even cover its working expenses, the permission of Government must be obtained before it is made derelict. And in a doubtful case the whole influence of the State will be employed to prevent such dereliction, in view of the public loss and inconvenience which it would entail. Thus in both directions the influence of the State—and of the public opinion which it represents—is potent to mitigate the influence of economic motives, pure and simple.

Thus far we have presumed political State influence, so far as it affects railway policy, to

be guided entirely by consideration of the public interest, by enlightened and disinterested national economics. But it is unfortunately the case that non-economic considerations do occasionally supervene—that questions are settled partially or entirely on purely political or even frankly venal grounds. From our point of view there is not much to choose. If there is undue hesitancy or precipitation, if political interest be allowed to any extent to determine the alignment of a section of railway, the granting or cancellation of railway rates, the making or unmaking of railway appointments, or the granting of valuable privileges, then economic motives are distorted and hindered, and the consideration of railway policy passes into regions where we cannot follow it.

But the lack of perfect economic freedom arises also to some extent from factors in the nature of railway management which have nothing to do with national economics, honest or dishonest, but are bound up with the character of such undertakings. Railways are in themselves large and expensive undertakings, involving the occupation of much land, the

destruction of much property, and the deterioration of more. They affect the sight, smell, hearing, health, and personal safety of large sections of the community. Thus not only must they obtain Governmental authority before they can be constructed and worked, but their very character prevents such authorization being given save in the most restricted degree. It is physically impossible for them to multiply indefinitely. They form, therefore, a natural as well as an artificial monopoly. Further, their immobility—once constructed—rests also on a natural basis. The legal and other preliminary expenditure they entail (large enough in the case of some English lines to almost pay for the total construction of a standard gauge line, say, in India) is sunk once and for all in their promotion: the land which they occupy, from its shape and contour, is largely useless for other purposes. The same is true of most of their buildings. In the words of Acworth: "The railways of England—the roads only, not counting movable property—represent an immobilization of some £800,000,000 of capital. This characteristic must obviously tend on purely selfish motives

to conserve a railway as a railway even when the reverse of prosperous, for thus alone can the owners hope to reap any revenue.

Lastly, it may be noted the interests of the staff—however highly trained and competent—tend in the same direction. For it is not probable that many of them can hope to find equally remunerative employment on other lines or in other spheres of life.

The result of these forces must clearly be to mitigate the full effect of purely economic tendencies; in the case of a well-placed line to prevent it from reaping the fullest possible revenue, but on the other hand guaranteeing it to some extent from possible competitors which might rapidly deprive it of its advantages — thus on the whole preserving to it the characteristics of its economic conjuncture. In the case of the less fortunate lines the tendency is to prevent their adopting the usual method of improving their position by raising their charges, and further, in the case of those clearly beyond the pale of prosperity, to preserve them as going concerns rather than to allow their owners to seek other more lucrative industries.

From these facts follow a further one: that the value of a railway becomes detached from its cost, from the amount of capital sunk in it, since this is so largely irrecoverable, and becomes intimately connected with its revenue-earning capacity, which is a "live" and important fact. The market prices of railway stocks reflect accurately their respective earning capacity, but have no recognizable connection with the capital sunk, or, in other words, the original cost of them.

CHAPTER II

ECONOMIC PRINCIPLES AND PRICE-DETERMINATION

Economic text-books teach us that, assuming the supremacy of economic motives, the determination of the prices at which commodities will change hands is based on one or other or both of two principles. The first is that prices will depend on the relative strength of the two opposed forces of supply and demand. The second is the tendency, through stress of competition, for prices to approximate to average cost of production.

The first principle only holds sway under certain conditions. The market must be one limited in space and time. That is to say, we must assume that we are only concerned with the amounts of the commodity actually "on sight," all of which are to be disposed of, and with the actually present and immediate

demand. We cannot take into consideration further supplies or further demands removed either by distance or time. In markets thus limited, it is clear that the only considerations will be the quantity of the amount offered and of the amount demanded, and that the prices paid will represent the relative strengths of these opposing forces. If the demand for a commodity be abnormally high and the supply abnormally small, as for instance would be the case with food during a prolonged siege, prices will be abnormally high, far above the actual costs of production. On the other hand, if the demand be abnormally low and the supply large, as might be the case with fruit in a sparsely-populated and isolated fruit-growing district towards the end of a favourable season, the price will be abnormally low, perhaps much lower than average cost of production. In more normal cases the fluctuations of price will be less marked and will bear more proportion to the costs of production. But still it will be the size of the amounts offered and demanded which, within certain limits, will fix the short-view price.

One division of transport affords a marked instance of price-determination on this principle, which is one not much in evidence in modern commerce, characterized as this is by world-wide solidarity rather than by the isolation and independence of markets. This is the case of maritime transport. The unit here is the sea-going vessel, and the number of these on any one day in any one port is strictly defined. Moreover, they cannot be allowed to remain idle in port without incurring heavy expense, against which there is no compensating revenue. Similarly the quantity of goods seeking transport is also well defined, especially when they are perishable, or seeking early despatch for a favourable market, or when the port is one where warehousing facilities are small. The result is that, with the exception of some kinds of "liner" traffic, ocean freights, being free from all Governmental supervision and usually the subject of full competition, are settled from day to day almost entirely by the varying strengths of supply and demand. This fact is of some importance in itself, because ocean freights have an important reflex influence on some

classes of railway charges, particularly coastwise and trans-continental rates.

But it is of more importance because it facilitates a comparison with the conditions of railway rates and enables us to see at once why they are not similarly determined. In the first place, the supply of railway carrying capacity is not so strictly defined in time and place. The capacity of a railway in relation to the demands of any one despatching point on its line is almost infinite: the sending of a telegram can indefinitely increase the amount of wagon-room in a few hours. Further, there are much smaller expenses entailed by keeping wagons idle; they can afford to wait much better than ships which are manned, victualled, and stored, and moreover are paying daily heavy harbourage dues. On the other hand, the demand is more evenly distributed since it is known that the railway is always available, is always there offering transport, not there to-day, gone to-morrow, as ships may be. Again, there is Governmental supervision ensuring solidarity, permanence, and a reasonable uniformity of rates, even when the whole capacity of the

line may be taxed to its uttermost. Thus all the conditions necessary for the action of this principle of price-determination are conspicuously absent.[1]

We come now to the second and wider principle of price-determination. As the limits of a market are removed, the amount supplied and the amount demanded in any one place are brought into relations with those at other places. Where the demand is specially keen, competing producers come into action and then rivalry tends to lower the price. Where the price is already low through a superabundance of supply, some suppliers remove in search of more favourable markets, and the price tends to rise. But price is limited in both directions. Excessive prices are prevented by the presence or possibility of competitors also trying to enjoy the benefit of an unusually high rate of profit. Unduly low prices are prevented by the necessity of

[1] The nearest approach to an exception is in the case of seasonal fluctuations in the strength of the supply and demand for railway transport which are considered to justify differentiation in rates. Specially low rates are quoted in the "off season" in order to secure some mitigation of the severity and inconvenience of rushes of traffic. But even this differentiation is partially due to varying costs of production.

each producer ultimately covering all the costs of production, with the average normal ratio of profit. In other words, competition tends to make prices approximate to the average aggregate costs of production.

Apply this doctrine in the first place to railway expenditure and railway income in the aggregate. Railway expenditure consists of two main items: (1) working expenses, which include salaries, coal, stores, repairs, maintenance, and renewals; (2) interest charges, consisting usually of debenture, preference, and ordinary stock, the claims of which rank in the order given, rates of interest being in proportion to the risk of non-payment. The amount of working expenses depends on the size of the railway and the amount of traffic, but more closely on the first than on the second factor. The amount of interest charges, being determined by the amount of capital—which is fixed and definite—is also fixed and definite, for specified rates of interest are fixed for debenture and preference stock, and the rate in the case of ordinary stock is fixed, though less definitely, by the rates earned in other industries of similar risk.

Now the amount of the total expenditure on a given line with a given traffic being thus definitely known, it should be possible to say that the aggregate earnings, which (the amount of traffic being *ex hypothesi* known) depend on the average rate charged, are automatically regulated so as to meet this expenditure. In certain cases an approximate equilibrium obtains almost from the first. But where it does not so obtain, it should on economic principles automatically result in due time; in the case of a remarkably prosperous line, by the advent of competitors resulting in reduced traffic, or the fear of such competition causing reductions in the charges made. In the case of non-prosperous lines, inversely, by a squeezing out of competitors or an increase of rates. But as we have just seen, such economic freedom does not exist. In the case of fortunate lines, State regulation prevents a full exploitation of their power. But since such regulation cannot ignore the weaker brethren, it cannot demand drastic reductions in rates even where it is known that they are yielding very handsome returns to the proprietors. In extreme cases, other

competing lines may be admitted to share in their good fortune. But on the whole, such lines must be allowed to retain the results of their perspicacity.

The case of the less fortunate lines is one deserving of closer examination. This will be clear from an analysis of the nature of railway expenditure and earnings.

First, as to expenditure. This may vary widely per mile of line according to gauge, the nature of the district, the general character of the line, number of tracks, the value of the land and property disturbed, and so forth. Within the British Isles the possibility of variation is particularly marked because of the enormous variation in density of population and value of land and property. Thus a light line may be built for £3000 or £4000 a mile, an economical standard-gauge line in country districts for from £10,000 to £15,000, while a trunk-line through dense urban property may cost up to £1,000,000 a mile, as did the Great Central's last few lines to Marylebone. Even in India lines of the same gauge may vary from Rs. 2·3 lacs to Rs. 1·2 lacs in the case of broad-gauge and from

Rs. 1·6 lacs to Rs. ·57 in the case of narrow-gauge lines. With such variation will of course go a corresponding variation in interest charges. But—and this is the important point—*below a certain minimum cost you cannot go*, however modest your proposals, however slender your population and traffic prospects. The gradation only begins above this minimum, and the minimum itself means a heavy expenditure and heavy interest liabilities. Moreover, though there is very considerable variation in cost, it is nearly always accompanied by a variation in the amount of traffic, which more than counterbalances it, leaving the most expensive line also the most prosperous, and the cheapest line the least prosperous. The total issued capital per mile of the L. & N.W. works out to over £62,500, a very high figure, but the traffic is such that it can pay $4\frac{3}{4}$ per cent dividends; while the total capital cost per mile of the Highland Railway is only £14,000, but it can only pay a dividend of $1\frac{1}{2}$ per cent. In fact, as Acworth says:

> We often hear it said that light railways ought to be constructed in poor agricultural dis-

tricts because, being cheaply built and so having a small capital per mile on which to earn interest, they would be able to afford to carry traffic at rates below those charged by the ordinary railways. The truth is: the fact that it is necessary to give artificial encouragement to the construction of such lines implies that there is little prospect of their carrying anything but a light traffic; that therefore the capital charge, though absolutely light, will be relatively heavy, for it will need to be borne by only a few contributories.

It is indeed often the case that the prosperity of a line is in direct ratio to its expensiveness, and not inversely, as we might naturally expect. And the same is true of the working or running expenses. Here again there are considerable powers of variation but with the same limitations. First, there is the irreducible minimum which must be spent by even the most modest of lines. For those same expensive things—way and works—which must be made if we are to have a railway at all, must also be kept in good repair and up to the same high standard of safety. Some trains must be run, and the service must be moderately good, or even the small traffic which does come will tend to depart. Salaries and wages must be paid and at the same rates

as on other lines and in other walks of life. All this inevitable expenditure gives a minimum which no considerations of slender traffic enables us to reduce. Again, too, such variation as is possible is more than offset by inverse variations in density of traffic. Indeed, those lines fortunate enough to rejoice in heavy traffic may not only spend more on maintaining, improving, and renewing their lines, may, and do, use less economical engines and give greater comfort and facilities to their *clientèle*, with no higher ratio of working expenses to total expenses than their more modest neighbours. They may, and do, go further than this, and work their lines at far higher ratios of expenditure, and yet pay better dividends. There are few lines in the United States which work at higher ratios than the Pennsylvania and New York Central, but at the same time few which give handsomer returns. The leading English lines work at high ratios (from 60 to 67 per cent), but they pay the highest dividends of any.

To sum up, therefore, as regards the possibility of working towards a just equilibration of cost and revenue, there is little to be hoped

for on the side of a reduced expenditure, since there are absolute limits to the possibility of such reductions under all heads. And such variations as are possible are almost always accompanied by a paucity of traffic which stultifies their importance.

On the side of revenue, similar facts lead, *mutatis mutandis*, to similar results. There are three alternative courses which open up vistas of an increased net revenue. The first of these is an increase in traffic carried at existing rates. If the forces of competition are assumed to remain stationary, such increase can only come from a general development of trade, almost entirely independent of railway affairs. The second is the securing by a raising of rates of such increase in revenue as will more than counterbalance the decrease in traffic which must accompany any raising of charges. The danger of this course is indicated by the important assumption necessary to make it effective that the increased return from higher charges will more than offset the result of a smaller traffic, and a further danger exists from the necessity of the reduced traffic bearing per unit higher

proportionate fixed charges, since these latter cannot be reduced *pro rata.* But the main obstacle is the force of public opinion and of the Governmental authority, to either of whom a most convincing case must be presented before this course is countenanced. The last and most promising course is the encouragement of larger traffic by judicious reductions in rates. With the reduction in earnings per unit, a greater number of units must necessarily be carried before the former amount of gross earnings is equalled, let alone surpassed. But there is no more surprising fact than the quickness with which traffic will respond to reductions if the district concerned be one in which there is reasonable population or average industrial development. Nevertheless, there are many districts in countries which have arrived at a high state of civilization and the natural resources of which have been developed as much as possible, but which are yet sparsely populated and devoid of great industries. In such cases the growth of traffic is strictly limited, and the most drastic of rate reductions can effect little. The lowest possible level will not

galvanize into life dwindling populations or decaying industries. No amount of enterprise, or of enlightened policy, can conjure up prosperity for railways in such regions. The fact, therefore, ever remains that even an expensively constructed and extravagantly worked line with fortunate conjuncture can attain a stage of prosperity which no amount of brains can produce for those badly placed. In other words, the gross revenue is as much dependent on economic conjuncture or monopoly rent as the amount of expenditure.

In brief, then, the general conditions of railway working are such that the amount of traffic—which is directly dependent on the general economic conjuncture—is of primary importance. And that the play of ordinary economic motives cannot be relied on to produce that equilibrium between gross expenditure and gross receipts which is common in the ordinary business world, and which tends to produce the same aggregate rate of profit in all similar businesses carried on under similar conditions. In the case of railways, prosperity or adversity is decided from the first—or rather, since it

may be hindered by bad management, the possibility of prosperity is decided from the first, though in a rapidly developing country it may not be directly apparent. Such monopoly value as a railway possesses, therefore, is largely dependent upon the district through which it runs, and as these districts vary in their economic richness, so do the values of the monopolies connected with them. But though competition may have much to do with low rates, monopoly has little to do with high rates. It is not the railways which have an average of high rates which are the envy of others. As Acworth says: "It is at least as true to say that rates are non-competitive because they are high, as to say that they are high because they are non-competitive," for no one cares to compete for the traffic of a district where owing to its lack of natural demand for transport the rates charged must be as high as possible on what traffic does offer.

CHAPTER III

ECONOMIC PRINCIPLES AND PRICE-DETERMINATION (*contd.*)

In the preceding chapter we have seen that the theory of price-determination by a necessary approximation to the costs of production cannot be applied to the aggregate expenses and receipts of railways. For we have found that there is no direct variation between the two sides of the balance-sheet, and that abnormal excesses or defects on either side are not automatically removed by economic adjustment, but tend to linger and to characterize the several undertakings accordingly. But the theory of price-determination according to cost of production is usually interpreted to mean far more than a necessary correspondence between aggregate expenses and receipts. It means that the price of each unit is determined ultimately by the cost

of production of that unit. Where the unit is large and simple, *e.g.* in the case of a boat constructed entirely by hand by one man, the only items of expense will be the material, the man's labour, and some trifling sum to cover the cost and wear and tear of his tools; and the price he will ask will be determined accordingly. Modern industrial conditions, however, are much more complicated. A factory or workshop will turn out very many units of many different kinds; involving raw material of varying values, processes of all kinds, simple and elaborate, machinery and labour of many sorts, and each unit of each kind must bear some proportion of those general charges which cannot be attributed to any one class of product, but must be borne by the whole. Yet even in much more complicated cases, a firm basis of prices is obtained from this principle. It is true prices will be affected by the varying strength of supply and demand for different things, by the presence of some monopoly element in the case of some products, and of the keenest competition with others. But on the whole — through and because of the

economic motive—the prices asked will bear very close relation to the average and ultimate costs of making them. The main exception will be in the case of real "joint products," *i.e.* things which must be produced together, which are the joint results of one art of production or operation, the costs of which can only be attributed to the two together and not to either separately or in any known proportions. In such a case the prices asked will turn chiefly on the varying demands for such products. This fact, as we shall see later, is of considerable importance in railway economics.

Now to what extent is it the case that the price charged for each unit of railway transport is determined by the cost of producing that unit? At first sight it may seem a very simple and satisfactory method of arriving at railway charges. The commodity produced is one—transport—and its cost per unit can be arrived at, and the price to be charged fixed accordingly. But this seeming simplicity is very far from being present in reality. For when we begin to think of concrete instances of railway transport we see that

they include commodities very diverse indeed. There are in the first place very many kinds of haulage, pure and simple—for long distances, medium distances, and short distances, with a cost per mile varying according to the distance; there is haulage of all kinds of goods, from coal and limestone to fruit, flowers, dynamite, and cigars, and of all manner of passengers, from a Royal party in a special train, or first-class express traffic to the Scotch moors, to workmen's journeys at 12 miles a penny or half-day seaside trips at similar low charges; there are also many subsidiary services sometimes given, sometimes expressly withheld—cartage, delivery, liability for damage or loss, refrigeration, use of company's wagons, express speed or slow travel, and so forth. In short, we see that the use of the purely abstract word "transport" gives a quite misleading air of simplicity to what is really a congeries of operations of the most diverse kind. Railways in fact produce a far greater variety of commodities than most industrial undertakings.

But it may be urged, this does not demonstrate the impossibility of basing your railway

charges on respective costs of production. This may be done in one or other of two ways, and if one is inapplicable the other should be quite feasible. The first and most obvious method is to classify your different services and apportion to each the peculiar expenses connected with it. Then take the whole of the remaining expenditure of a general kind and apportion that among the different services according to their respective prime costs. You will now know the expenditure involved by each service, and as you know the extent of this traffic you will be able to fix a fair and reasonable charge which will just give you your expenditure with a reasonable margin of profit. This is the argument of those who hold that railway rates can, and should be, based like the charge of ordinary business undertakings on the cost of service.

If the matter is so simple it should be child's work to apply it to the first great division of railway work, that between passenger and goods traffic. The simplest and clearest subdivision of railway working expenditure is as follows:

General Charges.

Way and Works—Engineering Department.

Rolling-Stock—Locomotive Department, including cost of running; Carriage and Wagon Department.

Traffic Department Expenditure.

Now of all these we have seen already that a good deal is not merely independent of any particular kind of traffic but is independent of traffic altogether. Among such heads of expenditure are directors' fees, the salaries of the managing, secretarial, and legal staff, the rates and taxes paid, the greater part of the cost of maintenance of way and works, a lesser proportion of the cost of maintenance of rolling-stock, and some part of the traffic working expenses. These items, since they do not vary considerably with the aggregate traffic of the line, clearly cannot be directly connected with the respective amounts of goods or passenger traffic. The cost of passenger and goods locomotives and rolling-stock can, however, be so allocated; so also the cost of their respective train-staffs; and some part of the expenditure of buildings. But the whole amount which can be so allocated is small; by one authority (Acworth) it is put at one-fourth

of the whole, and this one-fourth, he remarks, is not practically susceptible of any further or more detailed allocation. Indeed, the very variety of methods adopted to secure this allocation themselves testify to the difficulty of the operation ; train-mileage has been tried and abandoned, working engine hours are believed in by some, but the only unanimity among experts is as to the caution with which the figures arrived at must be viewed and utilized.[1]

If such an elementary allocation is difficult, not to say impracticable, it needs no argument to show that, *a fortiori*, any more detailed allocation between the different descriptions and amounts of goods and passenger traffic is out of the question. Still less is such an allocation between different train-loads, wagon-loads, or small consignments practicable.

The varying speeds, the different kinds of accommodation, the great variety in the number and complexity of the services rendered,

[1] In this connection it is a significant fact that in the great appeal case "Smith and Forrest *v.* L. & N.W., Mid., G.W., and other railways," though the Commissioners were inundated with statistics only one company attempted to discriminate between the cost of working goods and mineral traffic.

the different sizes of consignments, the different distances for which, the different directions in which, and the different times at which they travel—all these mean some difference in cost; but since this cost is made up of so many countless items, who can undertake to reduce it to a definite schedule of fair prices, however long and complicated? And to achieve a result of even useful accuracy when these difficulties are borne in mind, and at the same time it is remembered that the schedule must be simple, uniform, impartial, semi-permanent, and, moreover, must be known before, not after the consignment travelled—is, it will be recognized, indeed a hopeless task.

But it may be claimed that there is an alternative method with which no such accuracy is expected or desired. All that need be done is to take the number of units of work done, the passenger-miles and ton-miles, and dividing these by the aggregate expenses, to so obtain an average figure which will give a working basis for all rates. It is true we shall have to wait till the end of a representative period before this figure is attainable, but it may be held that railways change slowly and

that such a figure may form at least a semi-permanent basis for railway rates. But even for this less ambitious project there are insuperable difficulties. The average passenger-mile will link together such dissimilar units as special trains and bank holiday trippers, the average ton-mile such disparities as one ton of coal out of a train-load of 800 tons carried, say, 200 miles without a stop and with no auxiliary services, and a ton of cream cheese carried in small consignments over a few miles with many subsidiary services, collection, delivery, packing, weighing, and so forth. The respective rates charged will be as dissimilar as the services rendered. How, then, can it be hoped to obtain a useful figure in this way? The rate charged for the special train will be considerably above what the railway is glad to accept for ordinary passenger train miles, yet in view of all the special preparations and the responsibility entailed it may be far from excessive; the rate charged for the excursion train will be as far below the average receipts, but there is clear additional revenue so soon as the net return cost of hauling that train is covered. And so with the goods rates, the

coal pays a very low rate, but the size, regularity, and easy handling of the traffic make it most acceptable; the cheese traffic pays a high rate, but not too high in view of the care and work it involves, its very small and variable dimensions, and the high value of the cheese, making the cost of the transit an inappreciable item, besides say the profits of the retail trader, and an addition to the price which the well-to-do consumer willingly if unconsciously pays. Apply such an average figure in defiance of all these differing conditions, and the result will only be to kill the low grade traffic and to let off too lightly the high grade traffic, thereby seriously impairing the prosperity of the railway and ultimately injuring the trading public which needs its services.

CHAPTER IV

GOODS SCHEDULES AND THEIR BASIS

HAVING seen that the attempt to arrive deductively at a basis for railway rates founded on admitted economic principles is beset with difficulty and danger, let us now attempt by a brief historical review of the subject to make acquaintance with all the factors which enter into the question.

The considerations present in the minds of those called upon to fix and regulate the first railway tariffs were very different from those with which we have just been concerned. For one thing, the science of economics was in the earlier stages of its existence, and the economics of transport were an undiscovered country. But in any case it is doubtful whether to British minds principles would have had much say in the matter. In any

case it is certain that in actual fact they did not. The position was that the methods of inland transport available prior to the construction of railways were by stage-coach, stage-wagon, and canal. The prices charged for such traffic were known, and in the former two classes may be presumed to have been based on costs of production. On the other hand, the average operating costs of railways were an unknown quantity. But it was safe to assume that provided the first provisional charges were fixed appreciably lower than those in force among existing competitors, the railways would not lack traffic, since their superior celerity was speedily recognized. Hence it cannot be doubted that the first railway tariffs framed were fixed with an eye to competition, that is to say, the existing road and canal charges. Historically, the matter is a little complicated by the early view that railways would be worked in an exactly similar manner to roads and canals; that the road-bed alone would be the property of the railway company, for the use of which they would charge suitable rates, while its users would provide their own power and

vehicles, and would take upon their own shoulders the risks and responsibilities of professional carriers. In the words of the Parliamentary Committee of 1853 : "Railways were expected to be what they are in contemplation of law, new highways freely open to the public to pass with engines and carriages at their own discretion." This being the accepted view, it is not surprising that there is a marked similarity at this period between canal and railway charges. Thus in the following comparison :

1790. Glamorganshire Canal

	Per ton-mile.
Ironstone, iron ore, coal, limestone, lime, and manure	2d.
Stone, iron, timber, goods, wares, merchandise, and other things	5d.

1801. Surrey Iron Railway

	Per ton-mile.
Dung	2d.
Limestone, chalk, lime, manure other than dung, clay, breeze, ashes, sand, and bricks	3d.
Tin, lead, iron, copper, stone, flints, coal, charcoal, etc.	4d.
Other goods, wares, and merchandise	6d.

there is resemblance not only in the rates charged, but in the method of classification.

Special notice should be taken of the fact that the first primitive classification of goods in use on canals, which tacitly admits the principle of the differentiation of charge according to value or ability to pay, is at once adopted on railways and carried further. And since on canals and on railways in the earliest stages haulage alone was the service rendered, minus any of the subsidiary services of handling, storage, and responsibility which have since become the universal practice on railways, the recognition of this principle is peculiarly significant. For in regard to haulage pure and simple a ton is a ton, whether it consists of chalk or valuable stones. Yet it is recognized that while 2d. or 3d. per ton-mile is a suitable charge for the former, 5d. or 6d. a mile is a reasonable charge for the latter.

Let us now go a stage further to the time of the opening of the Liverpool and Manchester Railway in 1830. By this time it had been recognized that the conditions of railway working rendered unsuitable and impracticable the division of functions in existence on canals, and the railway company was authorized not merely to charge a toll for the use of its line,

but also to act as a common carrier of both passengers and goods. Therefore, while still retaining a system of tolls for those providing their own means of conveyance, it also fixed inclusive charges for persons, carriages, and cattle making use of its services as a common carrier. The passenger fares charged were fixed in accordance with a distance scale, but it may be noted that the first class fare was 5s. as against the 7s. 6d. charged by stage coaches, *i.e.* it showed a substantial "cut" calculated to successfully compete with the earlier method of travelling—an expectation very early and amply fulfilled. Much the same course was followed with goods traffic, but only as the early railways became able and desirous of coping with it, and this was not at the very first.

By 1845 the practical necessity for a unification of functions—possession of the way, the means of locomotion, the possession of stock and responsibility as carriers—was generally accepted, and the statutory schedules became stereotyped in very much the form in which they existed until modern times. This complete evolution was the work, not

of the State, but of the Clearing-House, which prepared a scale as follows:

MINERAL CLASS

S. to S. (Station to Station only.)	Class M. (A)	Applicable only to consignments of 4 tons. Rates not inclusive of use of company's wagons. Examples: coal, coke, iron ore, slag.
	,, M. (B)	Conditions as for M. (A). Examples: clay, sand, manure, limestone, chalk, etc.
	,, S. (Special).	Applicable only to consignments of not less than 2 tons. Examples: hay, straw, flour, chemicals, lead ore, etc.
C. and D. (Cartage and Delivery.)	Class I.	Iron pipes, sheets, vegetables and fruits, raw cotton, bottles, beer in cask, etc.
	,, II.	Mineral waters, beer in bottles, cured bacon (packed), biscuits, brass, china in casks or crates, etc.
	,, III.	Cotton and linen goods, cured bacon (unpacked), blankets, books, boots, china in hampers, tea, silver ore.
	,, IV.	Pine-apples, fresh hams or bacon, china in boxes or cases.
	,, V.	Amber, aniline dyes, peaches and apricots, basket work, bismuth, clocks, millinery, silk.

In the meantime, railways had increased and multiplied, and, what is quite as

important, had consolidated, amalgamated, and settled down into great systems, instead of remaining small, isolated, and independent. But each successive Act of authorization had presented a scale of maximum charges for conveyance. And from these maxima, in conjunction with the accepted classification, had grown up piecemeal, not an elaborate systematic scale of rates in force over the whole country, but in true British fashion the rough and ready equivalent of "Station rate-books," giving all the rates to and from the stations with which through booking was undertaken. And it should be remembered that, as judged by quantity of traffic, the most important rates of all were the special rates in which special considerations of competition or of the nature of the traffic led to drastic reductions in ordinary charges. This was the position until the commencement of the inquiry and legislation which lasted over the years 1888 to 1893. This period of reorganization commenced with the Act of 1888, which conferred on every British railway a revised classification for all goods, revised maxima rates and charges, and a statement

of all proposed terminals. This great work of revision was completed by the railways by February 1889. Objections were called for and duly appeared. Consultation and compromise followed, but was to some extent inconclusive. The whole subject was then taken in hand by the Board of Trade, which concluded its work in 1890. The revised classification and schedules thus arrived at, and which may be summarized as "existing rates plus a margin for possible increased cost of working," were then considered by Parliament and became law from January 1, 1893. The time allowed to the railways for the enormous work of adjustment was, however, insufficient, and in view of this, and recognizing that in many cases the maxima had been reduced, but unable to forecast the full effect of these reductions, they withdrew all special rates and fell back on the maxima thus enforced on them. The dislocation of trade which this action produced—and not least the unexpectedness of it—caused an outcry and upheaval which has become proverbial. It crystallized into the Committee of 1893, and the recommendations of this Committee

were embodied in the Act of 1894, as to which it need only be said that it threw the *onus probandi* in regard to proposed increases on the railway and facilitated appeals against them.

But out of this stormy period there remain the important changes embodied in the new classification and schedules of charges. The schedules of charges vary with different lines in some rough proportion to their circumstances, being lowest in the case of the great trunk-lines to the north, which possess valuable goods and mineral traffic, and highest in the case of the southerly lines, which are less fortunate. Two lines are instanced below: one (a purely northern line) is called "A," the other (an eastern line with access to London) is called "B."

MAXIMUM TERMINALS

Class.	Station Terminal at each End. Per ton.		Loading. Per ton.		Service Terminals.					
					Unloading. Per ton.		Covering. Per ton.		Uncovering. Per ton.	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
B	3d.	Same as for Railway A.	...	Same as for Railway A.	Same as for loading.	Do.	...	Same as for Railway A.	Same as for covering.	Do.
	6d.		...				...			
C	1s.		3d.				1d.			
I.	1s. 6d.		5d.				1·5d.			
II.	do.		8d.				2d.			
III.	do.		1s.				2d.			
IV.	do.		1s. 4d.				3d.			
V.	do.		1s. 8d.				4d.			

MAXIMUM RATES FOR CONVEYANCE, PER TON, PER MILE

Class.	First 20 miles or part.		Next 30 miles or part.		Next 50 miles or part.		Remainder of Distance.	
	A.	B.	A.	B.	A.	B.	A.	B.
A	1·0d.	1·15d.	·85d.	·90d.	·50d.	·45d.	·40d.	As for Railway A.
B	1·40d.	As for Railway A.	1·0d.	1·05d.	·80d.	As for Railway A.	·50d.	
C	1·80d.		1·50d.	As for Railway A.	1·20d.		·70d.	
I.	2·20d.		1·85d.		1·40d.		1·00d.	
II.	2·65d.		2·30d.		1·80d.		1·50d.	
III.	3·10d.		2·65d.		2·00d.		1·80d.	
IV.	3·60d.		3·15d.		2·50d.		2·20d.	
V.	4·30d.		3·70d.		3·25d.		2·50d.	

Scrutiny of these schedules brings out the following facts among others :

1. There is some difference in the maxima fixed by the State for different lines in England.

2. The gradation of service charges and of mileage rates according to varying value of commodities—which we saw to be recognized, even in the old canal schedules—is carried much further.

3. Rates per mile decrease as distance increases—a recognition of the lower cost and greater earning power per mile of long-distance traffic.

4. The tapering of rates for the different classes is explained not only by varying values but also to some extent by the varying amount and regularity of the traffic.

5. The amount of subsidiary services varies with different classes.

There are some further facts of importance which are not apparent from the schedules. The lettered classes A and B are not merely station to station only, they are also carried in owners' wagons for the most part.[1] Another and most important fact is that these and other similar schedules must not be taken as

[1] The question whether private wagons can be used for more valuable traffic is at present *sub judice*, Messrs. Spillers & Bakers, corn millers, of Cardiff, having claimed the right to use their own wagons for the carriage of flour—a claim rigorously resisted by the railways.

showing rates actually charged. In the first place, although, as already stated, they were drawn up with the intention of close approximation to previous actual rates, still they are maxima, and there are not many cases in which they are actually levied. Secondly, the great bulk of the traffic—say, 75 per cent—more particularly the lower grade traffic—is carried at exceptional or special rates not indicated at all by these schedules.

Mention having now been made of the chief factors present in rate-fixing, it will be instructing to investigate them further in order to discover the underlying principles.

CHAPTER V

GOODS SCHEDULES AND THEIR BASIS (*contd.*)

1. *Varying Maxima on different Lines.*—The existence of this variation—small though it is—must not be misinterpreted. It should not be attributed to the ascertaining of a varying cost of production per unit of transport. Such information—sufficiently definite and certain to be embodied in statute—cannot be arrived at. The investigation of varying costs of transport was undertaken by a very competent observer, Albert Fink, and led him to the conclusion that on a single line the cost might vary "all the way from 1 to 500," that is to say, by 5000 per cent. But what is meant is this: the capital of different lines is a definite sum and the interest charges are a definite sum; take these into account along with the density of the traffic, and you must

come to the conclusion that the burden on a line of dense traffic is so very much lighter per unit carried that they can well accept a slightly lower rate. Add, too, the facts that this dense traffic is regular, dependable year in and year out, and easily handled, and that the lines possessing it are also, by the possession of heavy mineral traffic, *ipso facto*, near or in direct connection with the coal supplies of the country, and can obtain their fuel without haulage over foreign lines. These constitute highly important factors justifying some differentiation in rate-maxima. Its actual existence in England must also be partially due to the attempt in these schedules to get to actuals rather than maxima. And it is to be remembered that such differentiation in maxima, though it exists in England—where principles are of small account alongside facts—is unusual, and meets with small recognition in other countries.

2. *Gradation of Charges according to Value.*—The basis of this practice is the quasi-monopoly enjoyed by railways. For it is clear that if they were the subjects of free competition through the whole of their services,

all their charges would inevitably be reduced to approximate cost of production. Articles midway in value would continue to pay rates much the same as at present; but the more valuable articles, now paying rates which may cover several times over average cost of transport, would refuse to pay such rates because of their ability to turn to competing agencies. And if they did so refuse it would cease to be practicable for the railway to charge specially low rates—below average cost—for the lower grade traffic. The removal of the quasi-monopoly enjoyed for all higher class traffic would therefore lead to a general upheaval and an entire alteration in the character of, and the charges made for, railway transport. What, among other factors, makes it possible to maintain the present state of affairs is therefore the monopoly existing at one end of the schedule of goods.

While this fact is the basis, the means and method of differentiation according to value arise from the fact that highly diverse railway transport is produced simultaneously in one complex and continuous operation. The construction, operation, and maintenance of

the system cannot be allocated in its different parts to different kinds of traffic as is the case with a mill, factory, or workshop. The whole operation is undertaken for the whole of the traffic conjointly, simultaneously. As Taussig has very clearly shown: "Railways present on an enormous scale a case of the production at joint cost of different commodities."

Now bring these two facts into conjunction—quasi-monopoly for some, but not all, traffic, and joint cost—and we have the rationale of rate differentiation according to value, or varying demand. Neither factor by itself furnishes a complete explanation. Not monopoly, for much of railway traffic is competitive. And if the different kinds of traffic were carried on quite independently, the obvious course would be for railways, while reaping all the benefit possible from their monopoly where it existed, to refuse to carry the lower grade traffic at rates below their average cost of carriage. Nor is joint production in itself a sufficient explanation, for if there were no monopoly as to parts of the traffic, the price of all descriptions would

be settled by the prices of competitors, and there would be no possibility of the higher charges for non-competitive descriptions paying for the low charges made for what was competitive.

But with the two factors of monopoly and joint production present, the varying of rates with value is not only possible, but has come to be regarded as inevitable and characteristic of modern railway working. The matter is of such prime importance that it must be discussed at some length. We have already noticed the fact that in the capital and recurring expenditure of railways it is impossible to graduate expenditure in exact accordance with the traffic expected, though such graduation is possible in almost every other form of transport except canals. The most modest of railway projects once decided on, inevitably involves large capital expenditure, and correspondingly large recurring expenditure on maintenance and working. But this unavoidable expenditure does not grow *pari passu* with the traffic, but more slowly. Whether or no the railway does from the first obtain an amount of traffic

sufficient to give it reasonable prosperity, it can deal with a large access of additional traffic with a much more slowly increasing expenditure. In economic language it is subject to the "Law of Increasing Returns." This being so, it is clearly the manager's first duty to aim at this accession of traffic, since every addition improves his dividend-paying prospects. Nor need he be particular as to his additional traffic producing the same average rate of profit. For to the exact extent to which he can undertake it without increasing his fixed or general charges—and this is a very considerable though not indefinite extent—he is justified in accepting it when it gives him his net increased working charges, plus some appreciable margin to help to pay the fixed general charges. Moreover, he is driven to some such course by the general trend of the economics of transport. The margin which any commodity can pay for transport to market is limited by the difference in values at the two ends of the journey, and by the proportion which this difference bears to the absolute value at the first place. That is to say, a valuable commodity can

afford to pay what, considered absolutely, is a considerable sum for transport, because this payment does not increase its final cost by a large percentage. But a low-grade commodity, with a value low in proportion to bulk, cannot afford to pay so much, or its price at the end of its journey will be increased to such a large proportion that it will extinguish the demand. Hence it is the more valuable commodities which make the earliest and strongest demands for transport, but as the traffic in these is worked up to its full capacity, the railway manager must descend to humbler game which can only afford to pay lower prices. Here he is again helped on in this direction by the fact of joint production. Not only is it the case that in providing for the higher class traffic he has provided also for much additional traffic (necessarily, as we have seen, of a lower class kind), but he is really quite unable to allocate the respective costs of the different species. He knows his aggregate expenditure, and he knows that it is caused by traffic highly diverse in kind, but it is theoretically and practically impossible to divide up this expenditure and to base his

charges on such allocation. He is driven back on the varying demands of the varying values, that is, to the varying ability to pay. In his own language, he charges for each kind "what the traffic will bear," or takes care *not* to charge what it will *not* bear. Some traffic he is sure of in any reasonable eventuality; this is where his monopoly begins and ends. Other traffic he must snatch like chestnuts pulled out of the fire from all his competitors, the sea, canals, roads, and other lines. The former can easily bear its due average share of total expenditure—and more. The latter must be offered rates which may be far below the average rate, or be lost altogether. So he adjusts his charges accordingly. The problem ceases to be one of economics altogether, and becomes tinged with ethical considerations. Indeed, the German economist, Gustav Cöhn, sees in railway rates a close resemblance to taxes in that the fundamental principle is *Leistungsfähigkeit*—what the purchaser can and ought to pay. It thus finds its ethical justification. It possesses also a utilitarian basis. For by thus catering for the lower grades of traffic which include the raw

materials of industry and the staple foods it is catering for the great masses of the population, both as wage-earners and as consumers. In the words of the Inter-State Commerce Commission of the United States:

> Such method of apportionment would be best for the country, because it would enlarge commerce and extend communication; it would be best for the railroads, because it would build up a large business; and it would not be unjust to property owners, who would thus be made to pay in some proportion to benefit received.

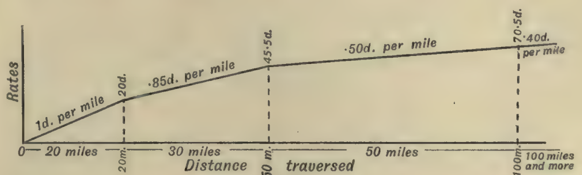
In its broader issues, the practice is one which is entirely justifiable. But we shall see that, as modified by the action of competition, sporadic and unequal in action, it may lead to results which are difficult to justify.

3. *Decrease in Mileage Rate with Increase in Distance.*—The grounds for the practice are several in number. In the first place there is the consideration of varying cost with varying distance. Though it is not possible to ascertain at all accurately the cost per ton-mile or passenger-mile for journeys of different lengths, yet it is known

that there is real economy of operation in longer journeys. Not only is there the economy felt in all wholesale businesses, as compared with retail, in that the larger quantities of goods dealt with in the former mean less trouble, less labour, less handling, and less account keeping; there are the peculiar factors of railway working, the heavy expenditure to be covered by the revenue derivable from the plant of the line, and the consequent desire to utilize this plant to its fullest capacity, to have it actually earning revenue for as large a proportion as possible of the total time. Since carriages and wagons only earn revenue (apart from terminal charges) when actually running, and earn nothing at all when merely waiting, the longer distances which give higher proportions of earning time are by so much more profitable and desirable to the company. This higher ratio of profit, which theoretically the railway might retain were its entire business a monopoly, it decides to divide with the public by the giving of lower rates as the distance increases. It is impelled to do so not merely by the fear of otherwise losing the traffic to its competitors,

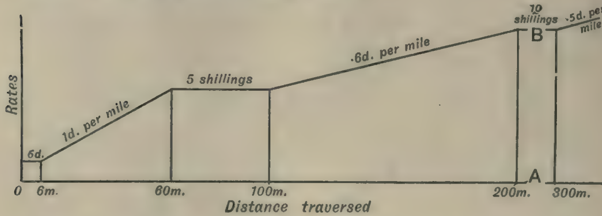
but by the fear of preventing its moving at all if charges are made which, though they can be paid for short distances, cannot be paid for longer ones.

The principle may be embodied in several forms. In England, as our instances show, one mileage rate is fixed up to a certain limit of distance, a lower rate for all distances in excess of that up to the next limit, and so forth. Thus the aggregate rate charged for any distance grows, unit by unit, with the distance, but at a slower rate. The only disadvantage is that a separate calculation is necessary for each distance. Graphically the English scale for "A" class goods may be represented thus:



The same system is largely employed on the Continent, where it is called the "Barème Belge" owing to its early use in Belgium. Another slightly different system, known as the "Barème à paliers," may be represented

thus, adopting figures somewhat similar to those of the preceding case :



which has the advantage of fixing a minimum charge. It is also characterized by a "Blanket" rate for certainly widely varying distances.

4. *Decrease in Mileage Rate with Increase in Distance for certain Classes only.*—The principle just dealt with, while accepted as just and reasonable, is in many lines modified in its application by consideration of the nature of the traffic. There is a good case for tapering rates for all classes of traffic, but the case is much stronger for low grade long-distance traffic, because this is greater in quantity and more regular; it is offered in large quantities, and easily dealt with; there is more competition for it from other sources; and—last but not least—there is its much lower ability to pay transport charges. Hence though in the new English scales the principle

of tapering rates is applied to all classes, A, B, C and I. to V., it is itself applied in a discriminating way, tapering off as the circumstances change in the manner shown, and the value of the commodities increases. This is evident from the following table :

Class.	Percentage which Mileage Rate for Miles 20-50 shows to Mileage Rate 1-20 Miles.	Percentage which Mileage Rate for Miles 50-100 shows to Mileage Rate 1-20 Miles.	Percentage which Mileage Rate for Miles over 100 shows to Mileage Rate 1-20 Miles.
A	85 per cent	50 per cent	40 per cent
B	71·4 "	57·1 "	35·7 "
C	83·3 "	66·6 "	38·8 "
I.	84·9 "	63·6 "	45·4 "
II.	87·2 "	72·4 "	56·6 "
III.	85·4 "	64·5 "	58·0 "
IV.	87·5 "	69·4 "	61·1 "
V.	86·0 "	73·2 ,	58·1 "

which shows on the whole a gradual decrease in the degree of application of the principle. Indeed, in many countries, *e.g.* in India, where the best of English railway practice has—owing to the presence of one central governing authority—been applied more scientifically and systematically than has been possible in England, the principle is only regularly applied to coal and coke.

5. *Subsidiary Services.*—We come now to the very important question of subsidiary services and the charges made for them. Curiously enough, though it was in England that the first railway promoters attempted to confine the functions of a railway company to the construction and maintenance of the line itself, and their remuneration to the collection of reasonable tolls for the use of the road, in no other country in the world have the functions eventually undertaken become so numerous, complicated, and important. It is true that the early conception of a railway's proper duty just referred to has left one important legacy, the right of private firms to provide their own wagons for mineral traffic —and perhaps for other traffic also—but with this single exception, British railways habitually undertake all the services undertaken by railways in other countries, and in addition a good many more. Of these services a great number are really incidental to railway transport, viz. the receiving of goods (often at a city office to obviate cartage over considerable distances to stations), weighing, loading, covering, shunting, hauling, re-

shipping at junctions, checking at destination, collection of freight, cartage, and delivery to consignee; warehousing for considerable periods—for perishable goods in refrigerator chambers; the keeping of goods in wagons on payment of moderate charges to enable them to find purchasers before delivery; some degree of supervision over animals entrusted to their charge, even to the extent that carrier pigeons will be let loose at the end of their journey! But in addition many English lines undertake work not necessarily associated with their main business, viz. the provision of hotel accommodation, or the establishment of steamer services, the running of motor cars by road over interesting bits of scenery, the collection and delivery of passenger luggage, the provision of passenger omnibus for travellers or of cars for London sight-seers—all intended to encourage and develop passenger travel. Similarly they are willing to do much to encourage goods traffic. To encourage the home producer of meat, for instance, the L. & S.W. Railway erected slaughter-houses adjoining their stations in the grazing districts of Devon and Somerset.

To encourage the manufacturer, all lines are ready to give him gratuitous advice and assistance in selecting suitable sites for a workshop or factory.

All this is, of course, in the way of business, and it is not for a moment contended that the motives are philanthropic. At the same time, these services represent a completeness of organization which is not only a credit to British railway men, but is of considerable convenience to their customers. But so far as these services might be undertaken at approximately the same charges by outside organizations—and many of them undoubtedly might—they are outside our purview. Their basis of charge is determined by ordinary considerations of cost of production and competition. We will therefore confine our attention to the services first enumerated, which are distinctly connected with railway work.

Is their basis the same complicated structure as that of railway charges for haulage pure and simple, or is it determined on ordinary economic lines?

Let us take first the case of the charges made for the use of company's wagons.

These are shown by the rebate allowed for the use of private wagons. This rebate should be approximately equal to the cost of interest, repair, and renewal charges on company's wagons. In point of fact it is probably less. For privately-owned wagons are not gratefully accepted by railways. They do not even rid the railway of the responsibility of adjusting their wagon-stock to the demand for carriage. For in busy times, when the private owners find all their wagons fully employed, they can indent on the railways for the further number they require. Thus they tend to make this problem even more difficult than it would be without them.

In addition, private wagons have this great disadvantage: they cannot go from anywhere to anywhere, but must go only on the journey prescribed by their particular owners. The different coal mines must be provided with their particular stock; these are then hauled to the docks and must be returned empty, save when their owners chance to have inwards traffic—after being sorted out from the accumulation there, and so forth. There is an increase in shunting,

classification, marshalling, all along the line, more empty running, less flexibility in working the stock and lower average use from it. It is true that mineral traffic involves much empty running in any case, and that some private owners may make up whole train-loads—though these are exceptional. But the whole consensus of opinion of transportation officials is against the private wagon, and if it were within their power to terminate the arrangement it would soon cease to exist. This being so, it is natural that the companies should endeavour to reduce the advantage as much as possible, and to fix the rebate as low as they dare, having regard to their competitors.

Take next the work of cartage and delivery. The practice is that the railways do not undertake this work in the mineral classes, but as a rule do so in the case of all other kinds of traffic, save when special rates are quoted which specifically exclude it. On a large scale in wholesale business they do not want it. Indeed, no one does, for it is necessarily cumbersome and expensive. Therefore, in the case of large mineral traffic

it has long been superseded by the use of private sidings, where the wagon is taken as near as possible to the place of origin, and then loaded by the trader. In the case of other traffic, it has from the first been undertaken by the railways in England. They have invested their capital in it, and have perfected their organization, and it is certain that they do not wish by abandoning it to throw out of use this plant and organization. But though no one—not even the railways themselves—know to what extent it is remunerative in itself, it may safely be assumed that the main reason explaining the desire of the railways to keep it is their fear that to give it up would involve the loosening of their hold on the traffic itself. In other countries it is not performed by the railways. Any attempt on their part to obtain hold of it, even if it were proposed, would be resisted —and probably successfully—by the private interests concerned.

Station terminals are supposed to represent the approximate cost of the accommodation provided by the railways at either end of a journey,—the warehouse and siding ac-

commodation, the labour and clerical charges, payment for the risk of damage or loss, and so forth. It is not to be supposed that the rates legalized and charged are based on any properly ascertained details of actual costs. Clearly such costs must vary enormously at different stations, though it is true that the enormous expenditure at the larger stations is offset by the heavier traffic. But that cost is the admitted principle is shown by a reference to the schedules. There are lower rates for the lettered classes of traffic—for which the services given are fewer and simpler—and which is large and frequent in amount, and of course unable to bear heavy charges. But for all the numbered classes the rates are the same, though the value and the amount of traffic in Classes I. and V. vary widely. The former class, for instance, includes screws and straw; the latter ivory and plush, highly diverse commodities. The general underlying ideas are cost of service and ability to pay, but the latter is only recognized at the lowest end of the scale.

Service terminals do not apply to the lower lettered classes "A" and "B," for

which loading and unloading, covering and uncovering are done by consigner and consignee. As applied to the "C" class and the numbered classes, there are very wide differences in the rates charged, the charges increasing very rapidly as seen below :

	Loading and Unloading.	Covering and Uncovering.
C	3d.	1d.
I.	5d.	1½d.
II.	8d.	2d.
III.	1s. 0d.	2d.
IV.	1s. 4d.	3d.
V.	1s. 8d.	4d.

These very marked differences certainly cannot be attributed to corresponding differences in the amount and difficulty of the work to be done. They must be largely explained by resort to varying ability to pay and varying amount of traffic.

Owners' and Railway Risk.—Under the English common law, a common carrier, who makes no explicit contract to the contrary with his customer, is liable for the loss or damage of the goods entrusted to his care.

And railways are not allowed to go behind the liability in the ordinary class rates. They are therefore in any transaction undertaken at these rates performing the subsidiary service of a temporary insurer of the safety of the goods. But they are allowed to—and usually do—make it a condition of any special rate that this liability shall cease save when the loss or damage is directly attributable to the acts of the railways' servants. The difference between owners' and railway risk rates should therefore represent just the cost of the insurance based on ascertained details of average loss and damage. In practice it is usually impossible to say just how far this expectation is realized, for the owner's risk rates are characterized by many other differences in the service rendered, and the minimum size of the consignment to which they are applied. But there are certainly cases in which the difference is out of all proportion to its risk, and the result is that the large shipper finds it to his interest to take the risk and to face any losses so incurred, while the small shipper has the difficult alternative of facing what may be to

him the possibility of a heavy loss or paying what he knows to be a high rate.

Non-passenger traffic by passenger train is the best example of the differentiation made for the non-acceptance of liability, because the services rendered are in other respects the same. And a comparison of the two scales of rates for such traffic certainly bears out the contention that the difference made is extremely great. Thus for parcels, the rates at owner's risk available for certain articles are nearly 50 per cent less than those at railway risk. The owner's risk rates for showmen's vans, bicycles, and such like things are at least 25 per cent lower than at railway risk. There is also a special low rate at owners' risk for newspapers. Clearly the large differences made are not explicable on the ground of excessive liability, for the parcels rates include many articles not specially perishable or fragile. The fact is that many of the low rates at owners' risk owe their existence to competitive forces, and would be in any case much lower than the usual rates. The inclusion of the owners' risk condition is simply the attempt on the part of

the railway to improve as much as possible the indifferent bargain which they are forced to make. This was in substance the answer made by the railway companies to the allegation made at the Railway Conference of last year, when it was urged (1) that the railway's liability should be enlarged so as to cover, not merely wilful misconduct on the part of their servants, but also gross negligence; and (2) that the railway risk rates were so much higher than the owners' risk rates as to make the former impossible for the ordinary trader. The settlement come to was an agreement on the part of the railway to somewhat extend their liability, but they did not agree to lessen the difference between the two scales.

CHAPTER VI

PASSENGER FARES

Passenger Fares are of three kinds: (1) ordinary traffic at schedule rates, (2) season tickets, (3) special fares. These may be discussed seriatim.

In regard to the first subdivision, it is safe to say that there is no description of traffic in which the semi-monopolistic character of railways, as a class and as compared with other transport agencies, is more strongly developed. Their advantage is not entirely in the lower cost at which they work: they can offer also greater celerity, comfort, and safety. Of the points at which competition infringes, the chief is short-distance traffic, in the case of which the advantage of quicker haulage is counteracted by the little delays in arriving and leaving stations, booking, waiting for

trains, and so forth. Comfort is also of less account on short journeys. But this competition exists almost entirely in urban centres, and chiefly concerns the business community going to and from work. It, therefore, more properly ranks for discussion under our second head. Water competition exists both by sea and river. The former is peculiarly handicapped by added risk and dislike or dread of sea sickness, while both sea and river suffer from slower speed, lower general comfort and accessibility, devious and restricted routes—these defects being too heavily felt to be met by the lower charges which they can offer. Hence, their competition is usually effective only when considerations of health or of their superior sight-seeing facilities give them special claims.

The strength of the railway position is to some extent reflected in passenger fares, both in their absolute level, the comparative levels of the different classes, and in the small degree of reduction which they show over periods of time. In regard to their absolute level, it is the arbitrary manner in which this has been arrived at which is most characteristic. To

say this is not to say that that level is unduly high, that it represents the exploitation of a monopolistic position to the extent of extortion. This is very far from being the case. As a matter of history, the first railway passenger rates were arrived at by making drastic cuts from those charged by the earlier competing agencies. The first lines to be constructed —which of course on the whole were those whose prospects were most favourable—found the rates thus arrived at remunerative in themselves and doubly so by reason of the stimulus the advantages of the new method gave to transport. They were adopted with some qualifications almost universally over the length and breadth of England. If they were arbitrary in the first instance, they were of course much more so as applied to all sorts and conditions of lines, with varying rates of expense and varying amounts of traffic. Yet their very arbitrariness has made them quasi-permanent, for their independence of all considerations of costs of service has rendered it unnecessary to vary them with variations in this cost. And the moderate remunerativeness which they gave has made them

acceptable on the whole to both the parties concerned.

The same conclusion is arrived at from a comparison of the different mileage rates charged for the different classes. Here, if anywhere, it might be supposed that differentiation would turn on relative cost. But clearly it does not. It is a notorious fact that the cost of providing a first-class carriage is very far from double that of providing a third-class carriage, and with the higher standard of comfort now being given in the latter, the difference which does exist tends to decrease, without any corresponding change in relative rates. Of course a truer comparison must take account of the smaller seating accommodation in the higher class, but the addition of this factor is by no means sufficient to account for the difference. The difference in capacity, too, has markedly decreased with the increase in corridor and lavatory third-class carriages, but no charge is made in fares on this account. Yet while the cost of providing and hauling a first-class passenger seat is much less than double that for a third-class seat, the double charge exacted, though arbitrary, is not unduly

high. Indeed, as all railway managers are aware, the net revenue per passenger mile is less for the higher class, and from their point of view the fares should be, if anything, higher than they are. The actual fares, therefore, are purely arbitrary, but since they represent very roughly the varying strength of the demands for different classes of accommodation, they are acceptable and convenient.

The arbitrary character of passenger rates of course gives some theoretical possibility of extortionate charges. In practice this is prevented artificially by the State, which in respect of this traffic is strengthened by the direct and widespread interest of the whole community and the comparative simplicity of the issues which arise. Economically, it is prevented by the great elasticity of passenger traffic, a large percentage of which being undertaken for pleasure rather than business —being in fact optional expenditure—is extremely elastic, the demand for it increasing and decreasing very markedly with the raising and lowering of prices. This is found to be the case even in countries where the standard of living and the spending power of

the community are low, such as India, China, and Egypt. Thus, there is direct incentive for the management to keep fares down to low levels.

As a matter of fact, passenger traffic on the whole compares very unfavourably with goods and minerals traffic in respect of remunerativeness, as may be seen from the following figures:

	L.&N.W.R.	Mid. R.	G.W.R	N.E.R.
Receipts per passenger train mile . .	49·94d.	41·66d.	47·30d.	41·90d.
,, ,, freight	117·72d.	75·94d.	84·36d.	137·16d.
,, ,, total .	75·89d.	60·29d.	61·92d.	80·66d.
Railway expenses per train mile . .	45·12d.	35·86d.	36·24d.	50·25d.
Net earnings per train mile . . .	30·77d.	24·43d.	25·68d.	30·41d.

Although the expenditure per passenger and per freight train mile is not, and cannot be, separated, the figures show clearly that passenger traffic is far less remunerative than goods traffic, even after taking into consideration the wider area of competition for the latter. Some explanation of this fact will be provided by our subsequent discussion of the more competitive kinds of passenger working.

If the competition of other transport agencies is not of great importance, there is no sphere of railway work in which the competition between other lines is more severe and constant. Even in regard to that part of passenger travel which is undertaken on business grounds—which is therefore secured to some means of transport, and in practice is with some exceptions secured to railways as against other transport agencies—there is the keenest rivalry between different routes. The shortest route of course fixes the fare, and the longer routes, while unable to charge more for this longer distance, must endeavour to attract by superior service and facilities, by better stock, corridor carriages, better lighting and heating, the provision of lavatory and refreshment accommodation on trains, higher speed, non-stop trains, and more frequent trains. In this fight some lines are helped and some are hindered by the greater mobility and more elusive character of the traffic as compared with goods traffic. With inanimate commodities it is more a case of "findings are keepings": the line which secures the traffic keeps it as long as it can, routes it over the home line for

the longest possible distance it can without demur, rather than by the shortest and most natural route. But the passenger can choose his own company, station, and train, and personal prejudices go for a good deal when time and cost are not widely disparate. This greater mobility tends to prejudice the naturally stronger claims of the shortest route and to strengthen the hands of its rivals. It increases and perpetuates competition, and therefore tends constantly to improved facilities and increased amenities. In England in particular it has involved railways in much unremunerative expenditure, while it has debauched the public taste until a standard of service and comfort is expected which in most countries can only be obtained at considerably higher fares. The present efforts of the companies to retrace their steps—though enforced on them (as they must eventually be also on the public) by every economic consideration, and though made with the utmost consideration to their *clientèle*—are not unnaturally received with hostility and misgivings.

Excessive rivalry reaches its highest pitch in respect of that most mobile and elastic

passenger traffic to which we have already referred—the purely pleasure traffic—for which the railways must first fight all other providers of pleasure and then must fight one another. This class of traffic will be further dealt with under our third head.

Season Ticket traffic, as we have seen in an earlier chapter, is characterized on the side of production, (1) by being chiefly confined to large centres of population, where on the one hand land and property are of great value, and where consequently the railways are compelled to expend large sums on the construction of lines and stations, which must be well within the most valuable property zone, while on the other, competitive influences are at their strongest—where they must fight against urban lines and against road routes, trains, and omnibuses with their ease of access and freedom from expenditure on way and works, a fight often rendered doubly unfair for the railways by enforced contributions made by them to the construction, maintenance, and even working expenses of some of their rivals; (2) by the striking inequality and unevenness of the traffic, which for the most part consists

of a rush in one direction in the morning and in the reverse direction in the evening, with the result that the rolling-stock which must provide for the busiest hours is empty for the rest of the twenty-four hours—indeed is not merely unremunerative for the greater part of the time, but must either be stabled in the city, where land is expensive, or be hauled empty to stabling sidings outside. On the other side, it is characterized by the inability of the bulk of their customers to pay anything but very low rates, the effect of which inability is often intensified by pressure from well-meaning but misdirected and ill-informed politicians. As against these difficulties may be set certain peculiarities which make the traffic acceptable. It is compact, regular, and constant. Full train-loads are guaranteed at least for some short time in each day, and are maintained without special effort over long periods of time. Further, the traffic needs little supervision, and the incidental work of the booking-office and platform are reduced to a minimum. Lastly, it has a value in that it necessarily entails other traffic—the travelling of the

families and the transport of their requirements. In all the circumstances, railways offer marked reductions on ordinary rates. The traffic is in effect the purchase of transport in large quantities, and in accordance with the custom of all businesses some corresponding reduction is made on each unit.

Nor is it to be supposed that all traffic of this kind is unremunerative. The average train-mile earnings are indeed in almost every case considerably higher than are obtained from ordinary longer distance traffic, where the percentage of seats utilized to those provided and hauled is far lower. But the high average earnings reckoned on this basis are tempered by the small mileage run in each day and the remunerative character of suburban stock thereby very much reduced. And where the factors of high expenditure enumerated above reach their maximum effect, as in the case of London suburban traffic, the whole problem is one of the greatest difficulty, not merely from the point of view of the railway, but from its national importance and the ethical and sociological considerations involved. The railways find themselves

committed to the heavy responsibility of catering for the daily journeys of thousands, and in course of time have expended large sums of money and built up elaborate organizations to cope with the traffic. They find themselves confronted with rising expenditure and with the prospect of dwindling rates enforced on them by their competitors. The revenue earned is sometimes quite insufficient to yield fair remuneration. Yet not only is it out of the question to raise rates, but it is necessary to face reductions unless the traffic is to be allowed to dwindle away—an alternative which the immobility of their capital expenditure makes it impossible to contemplate. Their position is thus a melancholy one; and, which is important for the country, it is an unstable one. A state of affairs in which one company is not merely unable to find increased traffic to meet rising expenditure, but is compelled to lower rates below a level already unremunerative, in order to check rapid declines of traffic, and the chairman of another is actually found congratulating the shareholders, not on the stoppage of a decline in their traffic, but on

the fact that the decline while still continuing is in a diminishing ratio, is a lamentable matter for the public as well as for the railway. It should be recognized—and by many is already recognized [1]—that these matters will have to be faced, that the state of affairs is not one for which the railway companies are responsible, save in that they have striven to meet difficult situations as well as may be, and that they may need protection and encouragement from the State in the quasi-public duties they perform.

Special Tickets, as we have seen, represent the degree in which railways as a class have to meet non-railway competition. It is recognized that, over and above the movements of passengers due to business and family reasons, when the necessity for journeys is dictated by considerations apart from the pleasure and change of the journeys themselves, there is a large amount of purely pleasure traffic arising from the surplus spending power of the community, the possibility of which expands as the margin between earnings and living expenditure increases. In regard

[1] *Vide* the last Report of the London Traffic Commissioners.

to this traffic, railways as a class must fight against all other methods of spending the available money, against other methods of travelling by steamer, motor, or coach, and also against quite distinct kinds of pleasure—theatres, dinners, books, pictures, and in fact all manner of comforts and luxuries. There is therefore keener competition with non-railway undertakings.

Further, there is very keen competition among the railways themselves, because this particular kind of traffic is free as air, to choose not merely any particular route, but any particular destination. Indeed, a family's change of destination from year to year is one of the most marked features of the traffic. This excessive mobility and elasticity has as one of its concomitants the necessity for vigorous advertising and canvassing. While an enterprizing railway hardly finds it necessary to advertise largely its services and facilities to any important extent except when there are competitive routes, it leaves no step unturned to bring to the notice of the public its different holiday resorts, their special attractions, and the favourable terms

it offers for transport to them. To this end attractive posters are issued and posted broadcast—artistic, ingenious, humorous—literature with all manner of useful information is distributed, inquiries answered and advice given, and all manner of arguments are adduced and urged upon the *clientèle*, while fast and comfortable trains with through carriages are arranged to make journeys quick and pleasurable. Those railways which possess holiday resorts at all distances can cater effectively for every kind of holiday maker, from the man who seeks the Scotch moors in August and September to the working man who hankers for a breath of the sea during the dog days. Those who serve only the more distant places must cater for the classes which can afford more elaborate holidays, with occasional bids for humbler traffic by half-day trips to places 100 or 150 miles away.

The expensiveness of working modern pleasure traffic is high in proportion to the revenue earned, but of course good trainloads are secured, and much of it is real additional traffic. It is thus, on the whole,

good business for the railway. And it has important influence for good from a sociological point of view, in that it brings charm and variety to the life of the worker, gives him a wide knowledge of his own and even of neighbouring countries, perpetuates friendship and family claims, develops and enriches places lying off the routes of business and centres of manufacture, and in general redounds to the health, happiness, and benefit of the nation.

CHAPTER VII

SPECIAL RATES—COMPETITION

We have now surveyed railway charges so far as they are systematized in schedules and classifications, and in the case of passenger traffic have also touched upon special fares. We have seen that the basis of these rates is equal mileage rates, tempered by considerations of (1) value or ability to pay, and (2) nature and cost of services. In particular, we have seen that the rates fixed for different kinds of commodities and for different distances must be sufficiently tempered or tapered as to successfully meet the natural inertia of less and less valuable commodities, or, in the case of passenger traffic, the competition of possible substitutionary methods of spending the available money.

But up to the present we have not had much to say about active competition for

goods traffic, that is to say, the effects upon railway charges of definite working transport agencies bidding one against another for traffic. This is because the presence and importance of such competition is only very slightly reflected in the schedules. These cater almost entirely for the non-competitive traffic, while the competitive traffic is carried on "special rates," that is to say, on voluntary reductions of the schedule rates given individually by the different railways between particular points. Such rates are to be found in England in the "Station rate-books" on which their business is in practice conducted, and in the case of other countries in special supplements to the published tariffs. In almost all countries this "special traffic" is of great importance to the railways because of its bulk, regularity, and on the whole its remunerative character, to the trader because it is in respect of the commodities concerned that transport charges—being a relatively higher proportion of intrinsic value—are of greatest moment, and to the community at large because they are the staples of life and industry. Its importance does, however, vary

in different countries, because that amount of the whole traffic which is carried at "special rates" bears some rough proportion to the intensity and reality of competitive influences.

These influences are probably most conspicuous in England and the United States of America, where railways are most free from direct State regulation. In England it is computed that 70 to 80 per cent of the total weight of goods traffic is carried at "special" rates, and in the United States the proportion is probably even higher. As their name implies, "special" rates are not explicable on any definite principle. On the other hand, all rate-discrimination, so far as it is at all justifiable, is based on definite facts which explain its origin and existence. Certainly there have been, and perhaps are, cases of purely personal discrimination, taking various forms, such as secret rebates, "midnight tariffs" (special tariffs put into force for twenty-four hours only, of which special notice is given to a favoured few), and so on. But these are obviously dishonest, and are outside our scope. Confining our attention to recognized classes of discrimination, as we shall see, principles

are involved, but they are so numerous, the importance of each is so variously recognized, and varying circumstances so affect the individual cases, that the whole subject is one of the greatest possible complexity. Indeed, no department of modern economics is more hopelessly controversial. Hence, it is naturally difficult to adopt one definite line of argument and to arrive at a definite result.

The position of the railways is roughly as follows. They are large undertakings with heavy and unavoidable obligations. The factor in their business implied in the "Law of Increasing Returns" indicates a large turnover as in every way desirable, subject only to the consideration that it must not be obtained at a net loss in prime charges. They claim full powers to attain this desired goal by giving full recognition to the following considerations:

1. Varying values.
2. Variations in length of haul.
3. " " conditions of haulage.
4. " " services rendered.
5. " " amount of water competition.

6. Variations in amount of railway competition.
7. Variations in amount of traffic.

Of these seven considerations, the first four have already been noticed, and it is not proposed to deal with them again. But in particular cases most, if not all, are involved, and it is important that this should be borne in mind. It is, however, the last three which are of the greatest importance in connection with special rates, and these we will now examine in detail. Cases constantly arise where differentiations in rates are attributable entirely to the presence of water or railway competition or both. Where water competition exists, it may usually be assumed to work at a lower basis of cost, and the lower order of facilities which it gives is *ex hypothesi* negligible, since we are dealing only with rates for articles of low intrinsic value. The working costs of water transport, therefore, provide a basis of rates which is at once a minimum and a maximum. It is a minimum since the water transport companies being business undertakings pure and simple, and free from the economic friction which exists in

the case of railways, must work at a profit. It is also a maximum, since the trader will have no sufficient reason for preferring the railway, if the railway's rates are materially higher. Where water competition is absent, the "bed-rock" rate is supplied by that one of the competing railway lines which possesses the shortest route. In practice the bed-rock rate may or may not be determined on the basis of that railway's ordinary schedule rates. Whether it is or not is of small importance, since this railway, by reason of the lower cost of operations due to its shorter route, clearly holds the "upper ground in manœuvrin'." The question is, to what extent are competitive railways justified in adopting rates designed to meet such competition? An ordinary business undertaking free from Government interference, possessing practical mobility of capital and labour, and without the complication of joint production, may safely be left to settle such questions for itself. Clearly it will not undertake any additional business unless it is in itself remunerative. A railway, however, may, and habitually does, undertake some business which is not fully remunerative

in that it does not bear a full share of great part of the costs of the undertaking. It may, and occasionally does, undertake some business which involves a direct loss in prime charges.[1] And in the case of a railway it is not possible, even in the latter class of cases, to leave them to their own devices, in the knowledge that such practices must automatically cease with no injury save to those who have inaugurated them. Even in the latter case, important interests are seriously damaged. Rival carriers find their traffic jeopardized by a foolish and suicidal policy, which they have as much right to resent as peaceful people the arrival of a man "running amok" with a loaded revolver. Producers all over the country find their economic position in their different markets capriciously altered and disturbed. And consumers are in no way benefited, for such

[1] Of course not permanently. But *vide* Hadley's hypothetical but quite possible case, which may be summarized thus: Railway A charges 25 cents, of which 10 cents = running expenses, 15 cents repairs, maintenance, and interest. Railway B comes into competition, and by successive cuts both lines reduce rates to 11 cents. At this rate Railway A loses 14 cents on every ton carried (since 25 cents are necessary for proper return), but if it refuses to take it at that rate, it loses 15 cents on every ton it does not carry.

Cp. also the suicidal reductions of the Atchison road in 1890, when extra traffic at any price was desired for market purposes. (*Vide* Ripley, *Railway Gazette*, July 2, 1909.)

necessarily temporary rate adjustments are not likely to reach them. Still, these cases are necessarily and fortunately few in number and limited in duration, as they inevitably lead to compromise and agreement. Our main concern is with the former class of cases in which prime working charges are covered with some margin, and these must be more fully considered.

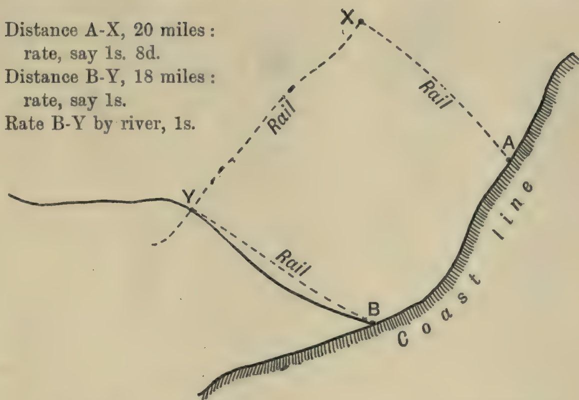
We have seen in our discussion of schedule rates that departure from the equal mileage rate principle—for which no special sanctity is claimed, but only definiteness and intelligibility—is recognized as necessary in order to bring in as much traffic as possible into the railway net. It is true that when this departure is shown in the schedules it is on definite accepted lines, a classification of goods according to value and the institution of a sliding scale on which there is a tapering of rates according to the aggregate distance traversed. Yet even when carried only to these lengths, the practice is an interference with the dispositions of nature. Nature gives to each centre certain advantages for certain industries, supplies of raw material, of economic

power, of natural facilities of communication. These relative advantages determine the general economic conjuncture and their position in different markets. Railways are built—in themselves artificial and disturbing—but if their tariffs are based on distance pure and simple, their effect is uniform, intelligible, and, so far as may be, natural. Each community retains such advantage as its economic conjuncture, now inclusive of railways, gives it. And the means of transport go far to determine the effectiveness with which a centre of production competes in the market. Now introduce a railway tariff based on a sliding scale. The economic dispositions are again altered. The nearer centres of production lose some of their former advantages in the markets. Their interests at least are affected. It is of course easy to show that they are in a hopeless minority—that the interest of producers as a whole, of the railways themselves, and especially of the consumers who represent the bulk of the nation, demand this tapering of rates which is necessary to build up the trade and commerce of the country. Our point at present is that the interests of the

minority have been over-ridden in the interests of a wider community.

Next turn to the case of special rates. Putting aside varying conditions and services, these are given because of the competitive rate, that is to say, because it so happens that nature or a competing railway company have provided the alternative route offering to take the traffic at this rate. This fact has nothing to do with the cost or with the value of the service offered. It is in itself arbitrary and accidental. As between such places, the action of competitive influences is irregular, uneven, and, so to speak, unfair. It produces differentiations in rates which not only possess all the characteristics of a sliding scale in affecting natural dispositions, but in addition are without a natural, intelligible basis, and therefore appear arbitrary, unequal, and unjust.

It will be well now to consider specific cases in order to bring out the nature of the facts alleged, the considerations urged, the principles adduced, and the decisions given. Let us take first a simple hypothetical case of water competition such as is shown in the following sketch.



Of the various parties concerned in the state of affairs, the traders at A and X are not adversely affected if, as we may suppose to be the case, the traffic relations between their towns are undisturbed. But no doubt they look with envy on their fortunate neighbours at B and Y who enjoy the lower rate and the resultant stimulus to trade. And they may reasonably think that the remunerative rate which they pay goes to make up the deficiencies of the 1s. rate paid by B and Y. The railway is benefited, since it secures a portion at least of the traffic between B and Y, which otherwise would have gone entirely by river, and which (we suppose) at least pays working expenses plus some margin. The

river carrying company is correspondingly injured, but it has the reflection that much of its capital (steamers, barges, etc.) is removable to other localities or readily saleable. It may even, by virtue of its advantage in loading direct into ships, retain sufficient traffic to pay fair dividends. Now if in this case the traders at A and X petition against the differentiation shown, two alternative results may ensue if they are successful:

1. The railway may be called upon to reduce rates A-X to 1s. But this we may suppose will be unprofitable business, and will be declined.

2. The railway may be called upon to abolish the 1s. rate B-Y. If they do so, they lose the traffic, the traders at B and Y are injured; and the traders at A and X also, since the railway's loss may affect them. The river company, however, benefits.

It is undeniable that there is some preponderance of interests in favour of the differentiation. If we exclude the interests of the water company, which has the advantage of mobility, this is undeniably so.

And in practice, the existence of water competition is commonly recognized in such cases as justifying differentiation, but there is

no unanimity. Thus, in England in 1890, when the Liverpool Corn Traders' Association complained that lower rates were given from Cardiff to Birmingham (173 miles) than from Liverpool to Birmingham ($98\frac{1}{2}$ miles), the railway's reply that this was justified in its own interests and in that of the public by the existence of sea competition from Cardiff to Bristol, and by river and canal from Bristol to Birmingham, was not accepted; but the railways were charged with an unjustifiable attempt to interfere with the "natural advantages" of the Severn ports by granting a rate from Cardiff, producing little or no profit, at the expense of the highly remunerative rate paid by Liverpool. This argument takes up the exact position occupied on page 257 above. But only two years later, in 1892, when what was practically the same case came up again, the railways were upheld by a majority of the tribunal on the grounds that it was advisable to give Birmingham the advantage of supplies, both from the Severn ports and from Birkenhead, and that the differentiation in rates was forced on the railway by the water competition in the former case. The weakness of this

decision, especially alongside the earlier one, is that it was not shown that the water route was unable to satisfactorily carry the traffic; indeed the railway's contention was based on the assumption that it could.

In America there has been a stronger disposition to recognize water competition as a justifying cause of differentiation. Thus in the Chattanooga case (Ripley, *Railway Problems*, x.) it is decided that though Nashville is given more favourable rates than Chattanooga, this differentiation is justified partly by its greater proximity to trunk-line territory, and partly by the existence of water competition, on the principle that such real and substantial competition constitutes a "dissimilarity in circumstances and conditions justifying a lesser charge to the more distant and competitive point, than to the nearer and non-competitive point." Again, in the "Savannah Fertilizer" case (*Ibid.* No. XII.), what would otherwise be a "manifest discrimination against Savannah" is accepted because the rate between Charleston and Savannah is dictated by water competition. Similarly in the "Southern Basing Point"

case (*Ibid.* No. XIV.) the Circuit Court and the Court of Appeal accepted the allegation of water competition from Montgomery, as justifying the lower rates to and from the Atlantic, which that place enjoyed as compared with the town of Troy, actually nearer the sea.

In all these cases the justifying arguments appear to be the same. The power reserved by the State of criticizing and regulating railway rates implies some corresponding obligation to protect their interests, especially as against competition, such as that of water transport companies, which *prima facie* have less expenses and are more mobile. The public interest is intimately bound up with a generally efficient and effective railway service, especially in view of the Law of Increasing Returns. Again, healthy rivalry between railways and water transit companies is generally sound and beneficial. Lastly, the discrimination against the places without such competition is more apparent than real. It is true the higher rates paid by them may go to amplify the contribution of the lower competitive rates to total charges. But it is better for them to thus contribute than for

the railway to lose the traffic altogether, an alternative which might positively increase their burden. And *ex hypothesi* they are not directly prejudiced in their local traffic. Thus, on the whole, there is a strong balance in favour of such differentiation, though the competition which justifies it may be sporadic and unequally distributed.

We come now to cases of purely railway competition. Here some at least of the arguments just summarized fail us. There is no question of the protection of railway interests in themselves, or as against water competition possessing economy in production and mobility; nor of securing for the public railway services in themselves desirable; nor of prolonging competition between water and rail in the interests of producers and consumers. It is entirely a question of different railways and of the effect of their respective interests on producers and consumers. The cases which arise are of several kinds. The simplest is that in which one railway possesses the shortest route, and has therefore some natural claims to the traffic; since it is, *prima facie*, sound economics for all commodities

which need transport to their markets, to effect their journey by the shortest route, thus keeping the increased cost borne by the consumer as low as possible. To what extent must this claim to traffic be respected? To what extent may this claim be neglected in favour of the better facilities and lower rates which active competition secures to the public? If the railways competing against the short line route quote rates too low to bear their full share of total expenses, how far is this prejudicial to their other clients and indirectly to the public? It is clear that such cases are not likely to find themselves in the Court of Appeal. For competition of this kind is directly beneficial to the shippers, to whom it brings increased facilities or lower rates, or both. Similarly, it is directly beneficial to the consumer and to the public at large. If we assume also that no railway goes so far as to accept such traffic at less than working charges, the only party directly prejudiced by the competition is the line owning the shortest route, and so possessing some moral claim to the traffic. Diversion from the natural route involves some slight

economic wastage and resulting increased burden on the consumer, but this is too small ever to become a permanent grievance, since the stronger position of the shortest route is to obtain the bulk of the traffic, whether or no there is an explicit agreement to that effect. Hence there are no cases on record of appeals against straight direct railway competition. Yet it is not without danger. In the first place, it is more than probable that railways will go too far in the matter, especially as their interests are in these cases not coterminous with those of the public. Thus it may be good business for a railway to haul goods from a place of production A to a market X, and to haul exactly similar goods produced at X to be sold at A.[1] But it is not sound public economics. Again, there may be a margin of profit in hauling goods by a route 3412 miles long,

[1] *Vide* instances given in Professor Ripley's article in *Railway Gazette*, 25, vi. 1909: "Dried fruits may be distributed by wholesale grocers at Chicago in the great fruit-raising regions of the west and south. Cotton goods made by southern mills may be shipped to New York or Chicago and then sent back again for final distribution with the addition of a middleman's commission and a double freight rate. The Colorado Fuel and Iron Company seeks special rates in order to sell goods over in Pittsburgh territory, while its great competitor, the United States Steel Corporation, has an equal ambition for the trade of the Pacific slope."

between two places possessed of a short route of 2500 miles, or in another case by a route 2051 miles long, when one of 1340 exists. Yet from the point of view of national economics, this again is waste—insidious and difficult to detect because it does not run counter to any special interest. But in the long-run and in the aggregate it is capable of serious results, and it follows that Governmental opposition to railway agreements designed to prevent it is short-sighted and detrimental to the general interest.

Another and perhaps more important class of cases is the competition of rival localities for a given market. Here we have, in addition to the interest of the railway and of the consumer, a clear-cut divergence of interest between different places. This trade rivalry is inevitably carried into railway policy. Either the rival places are served by one line in which preference is likely to be given to that which furnishes most traffic, having regard both to tonnage and the length of lead, or they are served by different lines, in which case the struggle between the two places is intensified and embittered by determined

efforts on the part of each line to foster and extend the trade of its protégé. This diversity of interest produces a corresponding diversity of opinion as to the justifiability of the rate-differentiation, and a comparison of the various principles involved in order to justify the different opinions expressed is a somewhat diverting occupation. Indeed, it inevitably calls to mind the dictum attributed to Lord Melbourne, and addressed by him to a recently-appointed Judge, to the effect that the latter need show no hesitation in delivering his judgments, for they in all probability would be sound, but to be aware of attempting to base them on any explicit principles, for if he did these would almost invariably be wrong. Among English cases we noted (p. 263) an instance of this danger in the decision of 1890, favouring the preservation of the "natural advantages" of the Severn ports, followed in 1892 by the rejection of these claims in favour of those of the Birmingham consumer. Incidentally, the recognition of the latter involved the success of the Liverpool producer as against his rivals on the Severn, but the latter decision is based

on that recognition of the consumer's interests as paramount, which is characteristic of British fiscal policy. In other countries, where the building up of productive centres is matter of more recent history, the consumer meets with less recognition. Thus in America we have clear cases of the rival claims of producing centres being the determining factors in the situation. The Southern Railway and Steamship Association give, as one of their objects in life, the securing of "a proper correlation of rates such as will protect the interests of competing markets without unjust discriminations in favour of or against any city or section."

The slender value of the principle, enunciated no doubt with such intentional vagueness, is shown by the fact that the Commissioners engaged in reviewing some of the Association's rates only quoted it in order to remark that the Association was not justified in interpreting it to effect "the impairing or neutralizing of the natural commercial advantages resulting from location or other favourable conditions of one territory in order to put another territory on an equal footing with it in a common

market." That is to say, if we carry their principle to its logical conclusion (and it is no principle if we are not at liberty to do so), it means that railway rates should preserve the economic *status quo* as between rival producing centres. Indeed, the Commissioners appear to have fully recognized all the consequences of the dictum. "Each locality competing with others in a common market *is entitled . . . to the benefit of all its natural advantages.* If the result is prejudice (*sic*) to one and advantage to another, it is not the undue prejudice or advantage forbidden by the statute, but flows naturally from conditions beyond the legitimate sphere of legal or other regulation." Again, in the "Eau Claire Lumber" case, Commissioner Knapp considers that "each community is entitled to the benefits arising from its location and natural conditions, and any exaction of charges unreasonable in themselves or relatively unjust by which these benefits are neutralized or impaired contravenes alike the provisions and the policy of the statute." The principle materializes in insistence on the "differential rule" or "long

and short haul" clause, under which the rate for a longer distance can never be less than that for a shorter distance.

In the "Savannah Fertilizer" case, however, there are signs of wavering. "Neither can it well be claimed that distance ought *not* to be a factor in the making of rates, and that a city is entitled to *no* benefit by reason of its advantageous position." Here we see a recognition of the impossibility of the *status quo* theory. And in the "Bogue award" this is explicitly stated. The only justifiable principle as between the competition of different centres for a given market, according to that judgment, is that those rates are justified which enable each party "to place its fair proportion in the territory under consideration." The word "fair" of course begs the whole question, but if this much-discussed award meant anything, it meant that the more distant producer should be allowed and encouraged to become an effective competitor. And clearly this view can be stoutly supported. For not only is the consumer thus protected, but the full growth of great businesses, with all those economics and

inefficiencies unobtainable on a small scale, would be impossible. Certainly, the industry and commerce of the United States would be very different from what they are if the views of Mr. Bogue were not as widely accepted and acted on in practice as they are criticized and rejected by theorists. The same idea meets with wide recognition in another great commercial country—Germany—though not without awkward consequences. Thus, Mr. H. B. Meyer relates that :

> A reduction in rates given to one district or locality must be followed by counterbalancing reductions in others, in order that no one should be given an undue advantage. The various district railway councils, as well as specially-appointed commissioners, were constantly engaged upon the most minute investigations into the relative cost of mining coal and iron and producing pig-iron at different centres in Germany with a view to recommending just and relatively reasonable railway differentials. . . . The jealousy of competing producing regions led each region to dispute the figures as to cost of production put forth by the other regions, and the Government found it extremely difficult to make an adjustment of rates satisfactory to each party to the controversy.

With the result that for sixteen years a reduc-

tion in rates recognized as necessary was delayed and prevented. The illustration is useful as showing an explicit recognition that in current opinion the ideal arrangement was for the different producers to market their goods at approximately equal prices, thus deliberately disregarding their natural advantages and disadvantages.

From all these examples and divergent principles a clear issue arises. There are the interests of the consumer on the one hand, and of sets of different competing producers on the other. The interests of the former are clearly to increase the number of producers competing for his favour and the degree of their competition, to balance them as nearly as possible one against the other, so that any decrease in cost, whether due to cheapness of raw material, decreased cost of fuel, improvements or inventions in processes, may be promptly passed on to him. But as between the different consumers who shall decide? Are the natural advantages of certain localities to be deliberately perpetuated to all eternity by the railways? Or is it their just aim to endeavour to subvert these, and to equalize

the full cost of production in the market, inclusive of the transport charges? There are awkward consequences attached to either view. If you adopt the former, you are setting at naught the interests of the consumer: you are artificially stereotyping differences in the economics of nature which Nature herself would never have stereotyped. You are removing many of the most potent forces tending towards invention and improvement in manufacture and transport. In short, you are attempting to attain a dubious ideal by more than doubtful methods. And in any case you are attempting to uphold a principle which in fact has long gone by the board. As we have seen, the first divergence from equal mileage rates towards classification and sliding scales is a divergence from the *status quo* theory. There is no difference in principle between the giving of lower rates on wheat to a wheat-producing centre than you give on tobacco to a tobacco district, or the institution of a mileage rate decreasing with distance on the one hand and the sharpest cut in special rates on the other. The principle in effect has never been observed, and never can be.

But if you take up the other view, what is the result? There will not be found many who would uphold the German practice of deliberately attempting to so adjust rates as to place all competing manufacturers in a given market on the same footing. Indeed, it would be impossible and impracticable to make the attempt save with one unified system of railways under a single control. But, looking at the question from a theoretical standpoint, where are the limits to be drawn? To what extent may distance properly be disregarded? There seems to be no natural line drawn between the theory of equal mileage with all its imperfections and the German ideal. Indeed, there is no limit provided by the application of any principle. The American jurists, in deciding such cases, find themselves lamentably adrift and resort to a most obvious and imperfect compromise. In the "Savannah Fertilizer" case the "true solution of the controversy" is found in a mean between the rival contentions of the near and distant producing centre. While it can hardly be said that a particular locality is entitled to "describe about itself a circle and

exclude its competitors from this area, neither can it well be claimed that distance ought not to be a factor." So long as the claims of rival producers alone are heard, it is merely a question of which shouts the louder. Railway rate adjustments approximate in character to juggling performances, and the very difficulty of attaining a position of equilibrium—however unstable—tends to stereotype rate adjustments and to counteract the adaptability and sensitiveness to trade movements, which is claimed as one of the greatest benefits of this kind of policy.

The interests of the consumer are a better guide. They are widespread and, so to speak, impartial; that is to say, independent of any particular group of claims. Their importance is to some extent recognized in the pronouncement of President Tuttle (*vide* Ripley, "Railway Rate Making in Practice," *Railway Gazette,* June 4, 1909), that "it is the duty of transportation agents to so adjust their freight tariffs that, regardless of distance, producers and consumers in every part of this country and of the world shall to the fullest extent possible have equal access to the

markets of all parts of this country and of the world." And it is entirely on the basis of the consumer's interests that the typical British decision in the Greenock sugar refiners' case rests: "That Greenock sugar refiners should be in the same market as the sugar refiners of London, while it may be a grievance to London refiners, must be an advantage to Greenock refiners and cannot be a disadvantage to buyers of sugar."

But the fact of the matter is that on this difficult ground it is practical considerations rather than theory which determine the day. No sane railway manager proposes to carry competitive traffic with complete disregard of distance. For to do so means that he must carry it at prices wholly regardless of the cost of carriage. And though it is true that he will—and, as we have seen, should—quote rates for such traffic far below the average cost inclusive of fixed charges, he will not go below the prime net additional cost of moving such traffic so far as the cost can be ascertained. And further, all his special rates take particular cognizance of one factor in the traffic not yet touched upon, and that is its quantity.

As all business men know, applications for special rates invariably produce one salient inquiry from the traffic manager, What is the probable average amount of the traffic? It is only when this is considerable and constant that the application is considered. And the weight attached to this factor is in practice a great help in the practical determination of the extent to which distance may be disregarded. For if the producer cannot compete in a given market to any great extent without a special rate, on the other hand he cannot obtain the special rate without the immediate prospect of considerable business passing. In other words, his desire to enter that market must be feasible and sound. His position as manufacturer must be such, his working costs sufficiently low, his output sufficiently high, to make the proposition a sound one. No "wild cat" idea of pushing a struggling business in all directions on the strength of ridiculously low rates is one which commends itself to the railway. There must be far more than this. Thus, the importance attached to the extent of the traffic is in practice a most important steadying influence.

This brings us to the last of the three reasons given for the quotation of special rates—the amount of the traffic. This consideration is difficult to detach from two others which we have already dealt with—the cost of service and competition. For it is in regard to traffic which passes in large quantities that, as we have seen, the services rendered by a railway—and correspondingly the charges made—are reduced to a minimum. And it is also round this traffic that competition mostly centres. But the amount—pure and simple—looms large in the mind of the railwayman. A steady traffic of 10 or 12 wagons a day throughout the year is a wonderfully attractive bait. It improves his wagon-loads, for it is handed over in complete wagon-loads, and in a lesser degree improves his train-loads. Suppose it extends to train-loads, if only to two or three a week, it still further improves their figures. And even at very low rates, the earning power of the wagon is so much improved that such traffic is highly prized. In this the railway manager is only realizing what is found true in almost every business under the sun—that lower

rates can be quoted for wholesale than for retail business, because the average returns are higher.

At the same time, the principle of "a reduction for a quantity" certainly does seem to involve the giving to him that already hath. The advantage of the large producer, his lower fixed charges per unit produced, his greater use of economical machinery, his superior position in purchasing his materials, and the greater range and variety which he can offer purchasers—all these are again reinforced by economies in transport. The natural result must be to tend to keep down the small producer, to undermine his prosperity where he already exists, and still more to prevent new men working up a business in competition with the older ones. It is true that the tendency appears to be in the consumer's interests, since he reaps the benefit of all economies in production. But the practice is not without its dangers to him, as well as its obvious harshness on the young producer. For it may tend to keep business in channels which are in truth growing out of date. In the Cincinnati Freight Bureau case (Ripley,

Railway Problems, VI.) the arrangement made by the railways was one which on the surface had much in its favour. The market was the "Southern Territory," and at the time the arrangement was made (1878) this market was served as to manufactured articles by the "Eastern Seaboard Territory," including Baltimore, Philadelphia, New York, and Boston; as to food products by "Central Territory," including Cincinnati, Chicago, and St. Louis. The rates were based on this idea: for all manufactured goods they favoured the larger producer (the "Eastern Territory") as against the smaller (the "Central Territory"); for food products, *vice versa*. This would appear fair to all parties and in the general interests of the consumer. But it was based on the assumption that the circumstances which led to it would not change—that Chicago would continue to all eternity to specialize in food products, and the Eastern States in manufactured goods. After a time this came to be anything but true. When the case was heard in 1894, it was shown that the manufacture of goods in Central Territory had increased 100 per cent, and no doubt the increase might

have been greater had rates been less repressive. Thus the railways were clearly endeavouring to perpetuate a state of affairs which was passing away. And the change was of a perfectly sound kind, for it tended to lessen the transportation charges on manufactured goods to be borne by the Central Territory as these began to be produced locally, while it gave the Southern consumer the benefit of wider supplies and keener competition in his market. It was therefore to be encouraged in the general interest.

Many similar cases have arisen in regard to rates given for wholesale dealing, *i.e.* to warehousemen or middlemen. Reduced rates are given to towns of some importance for large quantities of traffic, and these towns become distributing centres. The special rates which they enjoy are among their most valuable assets. In themselves they are perfectly justified, for competition among these middlemen passes on the benefit to the consumer by way of the retailer. But they must not be held as sacrosanct to the exclusion of all new centres. If this is done, not only are the newer centres unduly held back, but the

benefit of low rates is not pushed on as far towards the consumer as it should be, and as it will be if the distributing centres are encouraged also to move onwards.

Thus the consideration shown to the large dealer must be tempered with discretion. Due consideration must always be given to rivals springing up. It is to the public interest that these should be given adequate help, and there is small danger of their being shown undue tenderness because of the natural predilection of the railway for large business.

There is one other important class of special rates, comprising within them all the characteristics mentioned, the presence of water and railway competition, and the largeness and regularity of traffic, which deserve separate notice. These are export and import rates. Here we have two streams of traffic moving between two countries. In the two directions they are generally unequal in size and different in character; for, on the whole, a country exports what it does not want, and imports what it does. Food-producing countries such as the United States, Canada, the Argentine, and India export chiefly the products of the

soil—cotton, wheat, maize, corn, and various seeds. They import manufactured goods. On the other hand, England, Belgium, Holland, and Germany have to import large quantities of food-grains, while they export iron and steel goods, machinery, cotton, linen, and woollen goods, and so forth. There are usually differences in the total value of the exports and imports of any country, and much larger differences in their bulk, size, and weight. Thus one feature of the traffic is its unequal character. Another feature is the intervention of the sea. All countries are separated from most others, and some from all others by the sea. There is therefore water transport from one country's port to another, and the traffic is free to utilize any one of a great number of ports in either country, so that for any body of traffic which we take into consideration there are many alternative routes by different ports and over different connected railways to the internal centres concerned.

Moreover, by each route the respective proportions of water and land carriage vary, and this further complicates matters because

it prevents any one route easily establishing a position as the shortest and therefore ultimately the cheapest route, and so dictating a maximum rate to the other routes. For the route with the shortest sea passage may and probably has a longer land journey. And the greater expense of train carriage is an offset to the shorter and cheaper sea passage. Conversely, the longer sea passage may mean shorter rail journeys, which more than counterbalance the former. Then the relative importance of speed and cost must be considered, and speed is an important factor with food-products. All these considerations tend to prolong and to intensify competition. And the inequality of the traffic again comes in; for to run ships in ballast for half their time is a ruinous arrangement, and when a shipping line has constant and certain traffic in one direction it can go very low indeed in the opposite direction, for traffic carried at very low rates is better than water ballast.

There is therefore very keen competition between different routes. In some cases the rivalry of different routes is specially acute, because it is of an international character.

Thus German ports, considered in comparison with the Dutch and Belgian ports, would naturally have a very poor chance of engaging in trade with England. But it is of paramount importance to Germany that Hamburg and Bremen and other places should obtain a firm standing in the most important trade. And the unified State-management of her railways makes this practicable by the arrangement of rates to those ports which are practically subventions paid by the nation.

Another feature of the traffic is its connection with general fiscal policy. In many countries the old "Mercantilist" theory that exports are *prima facie* of more value to a country than imports, still meets with implied acceptance. Certainly the view that the nation's industries should be helped and encouraged against the rival industries of other countries is still widespread. This leads to the establishment of tariffs peculiarly favourable to exports and hostile to imports. And this even when all other circumstances are identical. Thus the rate on exported spirits, Paris to Boulogne, is 10 fr. 55 c. per 1000 kilos, while that on imported spirits

in the opposite direction is 22 fr. 10 c. Clearly such a policy may be uneconomic, for it may discourage traffic in the direction in which it is needed to effect equalization. It would, however, be free from this objection in England, where imports greatly exceed exports in bulk and value.

Again, the traffic is distinguished by its size and regularity; by its arrival in shiploads, in large consignments sufficient to fill wagons or perhaps trains; by its being well packed and well classified. Further, it can generally be handled direct from shop to wagon; it is usually consigned for considerable distances, over which only haulage pure and simple is needed, without shunting or other incidental work; it is taken delivery of promptly and under well-organized conditions; the amount of clerical and accountancy work is small and simple; and the firms in it are usually large and well-established. From the railway point of view it is excellent traffic.

All these features are reflected in the rates charged. And especially must these recognize the inability of the traffic in its greatest possible development to bear anything but

the lowest possible charges. The natural result is that the rates charged, although often most remunerative to the railway, are far below what is charged to the home producer and the home consumer in the same trade, below what are paid by them in other trades of higher class commodities; and as between different import and export routes, the rates by the longer are much less per mile than by the shorter.

The considerations urged by the railway are those with which we are familiar. The implacable maxima of the water rates, and apart from this, the inability to pay higher rates, the peculiarly valuable qualities of the traffic, the absence of any inherent unreasonableness in the domestic rates with which these special rates are compared, and the "dog-in-the-manger" spirit displayed in such unfavourable comparisons. These are all entitled to due consideration.

To them further may be added, where it exists, the political motive, the desire to encourage production, to hold the home markets, and to obtain a footing in foreign markets.

On the other side what are the objections? They are of two kinds. First, in regard to import traffic there is the cry of the home producer that he is prejudiced in his efforts to cater for the home market. This complaint perhaps is entitled to the least consideration. It is stated, time and again, that the railways of this country are quoting lower rates from a port X to their terminal in London than they give from a place Y, intermediate between X and London. Such allegations have been made in England against the L. & S.W. Railway in the Southampton case in respect of dairy produce, hops, and hay; against the L. & N.W. Railway in respect of American and Cheshire cheese, and meat; against the G.W. Railway in respect of the same traffic; against the S.E. & C. Railway in respect of French hops, fruit, and vegetables. In fact, few English lines serving any great mart can have avoided having to meet such charges. Yet it is in England that it is easiest to prove that the charges are unfounded, and are based on imperfect analysis and unfair comparison. The essential feature in any discussion of this matter is to eliminate

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differences in the nature of the traffic and to compare like with like. It is necessary to take into account the total amount of the traffic, whether offered in train- or wagon-loads, its regularity and punctuality, the size of the consignments, the way in which they are packed, the amount of terminal work at each end, the amount of intermediate shunting and classification, delays in waiting to be loaded, attached to trains, and unloaded, clerical and accountancy work, and other details literally too numerous to mention. It is a safe statement that, provided all these factors are given due consideration, but no more, English railways will be found to have on the whole showed distinct favour to home produce as against foreign produce, and that any rate open to the latter is open on the same conditions to the former. They have offered special facilities, such as warehouses, use of sacks, the erection of slaughter-houses, and so forth. They have agreed to accept very small lots at the most favourable price in order to cater for the small home producer; indeed, have gone so far in this direction that the large home producer feels

aggrieved in getting no better terms. In every way they have done their best, and the most convincing proof is the entire absence of clear cases to the contrary among the records of English railway judgments.

If any one interest can complain of import rates it is those engaged in purely domestic trade of a non-competitive character, whose railway rates compare unfavourably. But they are all consumers, and consumers benefit more in regard to such food-products than they suffer loss in other directions.

Secondly, there is in regard to export rates an objection—less often voiced but more difficult to meet—that the domestic consumer is sacrificed to the interests of the producer of export traffic and of the foreign consumer for whom the latter caters. In America this complaint is often voiced, for there the railways are more independent of State influence, and there is considerable freedom in the discussion of fiscal matters. It is especially urged in regard to wheat traffic, in respect of which it is said that the position of the United States is so strong, the necessity of its supplies to the importing countries so

absolute, that it determines prices, and that the low rates given for such traffic are therefore not called for by the exigencies of the market's demands. This argument is more convincing as to the past than as to the future, for the decrease in the United States' productiveness for export and the increase of her competitors tend to weaken her position, while the improvements in northern waterways have strengthened the effect of water competition. So that low rates for export wheat cannot safely be looked upon as a free gift to the foreign consumer. In continental countries adopting a similar fiscal policy the complaint is less explicit, partly because of the predominant influence of the bureaucracy in fiscal matters, and partly because of the national faith in Mercantilist doctrines. Further consideration of this matter brings us within the domain of fiscal policy, the connection of which with transportation will be briefly noticed in the concluding chapter.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

We have now come towards the close of our discussion, and it seems desirable to summarize the conclusions arrived at, in order to state if possible some tenable theory of railway rates and to indicate some lines of policy which might be reasonably advocated.

We have seen that on the side of production, in respect of their nature, construction, and operation, railways are characterized as follows :—

1. They are semi-monopolies : partially dependent on State sanction, subject to State surveillance and regulation on the one hand, but entitled on the other to corresponding State protection and proper recognition of their vested rights.

2. They are economically immobile—their expenditure does not correspond to their earnings, they are subject to the Law of Increasing Returns, and they are in some degree joint production industries.

In regard to the distribution and sale of this commodity, of railway transport, they are:

1. Unable to fix prices either on the relative strength of supply and demand, or on a basis of cost of production: since they are not entirely subject to competition, and the ascertaining of the costs of their units is impracticable.
2. Uniformity of charge is impracticable. All things cannot be charged the same rate because the services rendered vary, and in any case such a policy would be ruinous to the railway and disastrous to the country. Nor, for similar reasons, can different things be charged equal rates for any distance. Charges must be varied according to value, distance, and the nature of services rendered.
3. Competition enters into the determina-

tion of railway charges at various places, and necessitates variations independent of the considerations already mentioned. Its action is facilitated and furthered by the peculiarities of production already mentioned.

4. The effects of competition, being unequal, uncertain, and irregular, are difficult of regulation. Some interests inevitably suffer. As between producers and consumers, the latter, being most numerous, should prevail. But in many countries fiscal policy tends in the opposite direction. As between different producers, the consumers' interest may help to decide, or practical considerations. No rational principle can be invoked to decide such questions.

The foregoing summary is sufficient to show the futility of the various efforts to give in one word or one phrase the theory of such a complex subject. The number of these efforts and the diversity of the views expressed emphasize this. Thus one learned writer sums up the whole matter as a case of

monopoly, the owners of which levy tolls or taxes graduated on quasi-ethical grounds; another relies on the value of transport in the case of different commodities, or, in other words, their varying ability to pay; another would fain find refuge in the time-honoured principle of equal mileage; another in the more plausible one of costs of production; another in socialistic "blanket" or "postage stamp" rates. As we have seen, no one of these theories is without its due meaning and truth, but no one of them is a sufficient and satisfying explanation of the whole facts. As is so often the case with highly controversial subjects, the theorists are right when they affirm, but wrong when they deny. They are correct in insisting upon the truth of their view, but wrong when they advocate it alone to the exclusion of other points of view, quite as well justified. For not only are the facts too complex to be capable of hasty summary, but there are various ideals, varying with country and circumstances, one right in some cases, a second in others. Full knowledge and wide experience are necessary to arrive at a full comprehension of the whole subject.

It follows that any attempt to indicate

lines of policy suitable for all circumstances is a hazardous experiment. For a line of policy should be directed towards some ideal, and ideals must take some cognizance of the varying circumstances of different countries. In England the birth of railways was coeval with the rise and dominance of the *Laissez faire* school, and though the common-sense of the nation insisted on some surveillance, both of the operation and economics of railways, the economic ideals of the time dictated by England's peculiar advantages at the commencement of the manufacturing era have left their mark on our railway history. The direction in which State influence has made itself most felt in England has indeed been in methods of operation, in respect of safeguards for life, limb, and property, as to which a standard of safety, not to say elaboration, has been reached and maintained which is the wonder of other nations. In regard to the economics of railway working, one might say that the English policy for long was to consult chiefly the interests of the consumer and to do this by translating the dictum "Anarchy plus the policeman" into "Maxima rates plus

competition," with an implicit recognition as to the futility of the maxima. But this policy was partially rejected during the upheaval of 1888-1893, and an attempt—though necessarily an ineffective one — was made to approximate maxima and actuals, which appears to indicate a greater recognition of the claims of the trader, induced no doubt by the rising prosperity of England's competitors. The present position in regard to rates, however, is an indeterminate one, since it rests on the actuals of a particular period in time. In more recent years it may be said that our former British policy has been so far retained that the perpetuation of competition has been insisted on, and the power of the State has been invoked to force it on unwilling companies—an attempt ludicrously doomed to failure. That is to say, the efforts of railways to free themselves from wasteful competition and to substitute intelligent co-operation have been frustrated, so far as possible, by Parliament, and this although the only justification of such hostility—the prospect of an undue reduction of reasonable facilities formerly enjoyed—was not established.

But if it may be taken as certain that the State's function in national life and commerce is now held by the British nation to be wider and deeper than it was fifty years ago, this change of view should most certainly have one corollary. If it is to be granted that the State can, and should, interfere more than it has done with quasi-public bodies such as railways, it should be recognized that with each such assumption of authority goes a corresponding responsibility. It is not only the public who need protection from the railways; it may well be that the railways need protection from the public, that they should be freed from extortionate rates and taxes, from illegitimate competition, from preposterous demands, and perhaps from chronic poverty. Further, if the State is to take a greater share in management, it should formulate some policy and emulate some ideal. That some tribunal is necessary to check uneconomic working, to protect minorities, and so forth, will hardly be disputed. And most people would welcome a governing body which would formulate and pursue a definite policy. But that the duties of such a body are difficult, elusive and

delicate, we have repeatedly seen. What is open to doubt is whether an ultra-democratic constitution, with party government, can compass its provision, or having provided it, can perpetuate, guide, and control it.

In many other countries the ideal has been more clearly indicated by circumstances. The superiority of manufactures as against agricultural industries in increasing population and wealth were soon apparent, and the artificial encouragement of home industries has therefore been indicated as the national goal. This involved as the first step the fostering of export trade, to be followed by the utilization of the money so gained in building up all manner of industries. Low export railway rates were thus necessary, and they were often counterbalanced by high import rates, the bonds of which differentiation were only relaxed so far as imports were necessary as means to the end of establishing home industries. Such a policy has prejudiced the home consumer, who has had to pay for the artificial stimulus to the export producer, and at the same time this line of action has necessarily benefited the foreign consumer.

Further, it is in itself uneconomic as tending to produce irregularity of traffic. Yet it cannot be said, in view of the successful attainment of the ideals arrived at, that it is wrong either in principle or in method. Indeed in the case of countries which are as yet only partially developed, a similar policy, *mutatis mutandis*, would appear to be indicated as in the general interest. It is adopted in Canada and Australia, and it must ultimately be adopted in India and China. For so far as human wisdom can see, the goal of material prosperity must be taken as the growth of population and wealth, and these can only be attained by the full development, within the limits assigned by nature, of a country's manufacturing and industrial resources.

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THE END

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